

DECEMBER 1953 • Volume 68 • Number 11

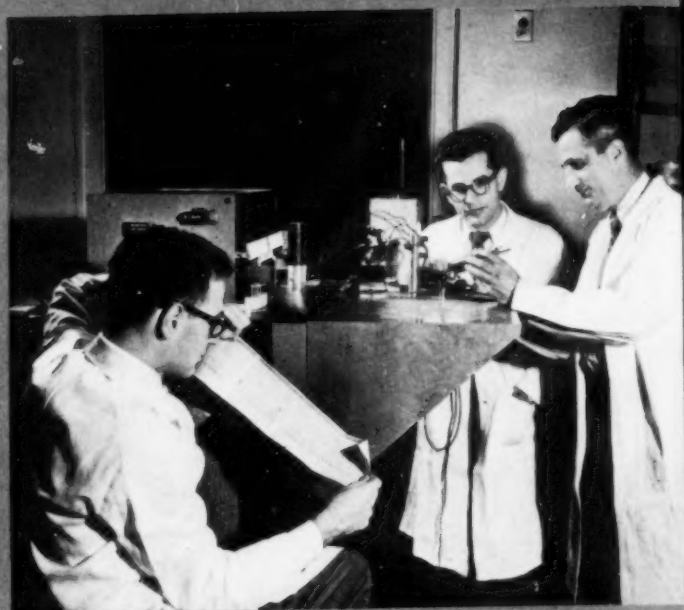
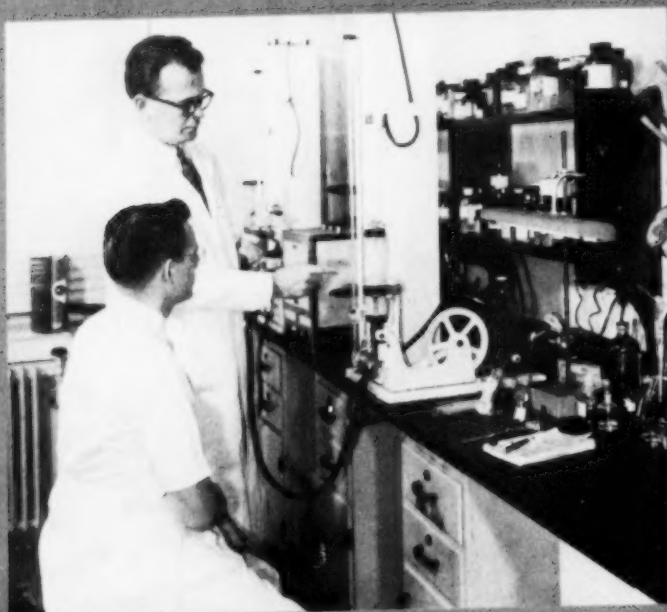
# PUBLIC HEALTH REPORTS

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- The Effect of the Use of Gamma Globulin in the Control of Malaria
- Screening Methods and Results
- The Economic Benefits of Malaria Control
- The Role of the Health Department in the Control of Malaria
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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service



*The Scientific Team*  
*in Cardiovascular*  
**RESEARCH**

see overleaf





# PUBLIC HEALTH REPORTS

Published since 1878

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# The Scientific Team in Cardiovascular Research

The early disciples of Koch and Pasteur made significant advances using individual skills alone. Research today, however, looks to teamwork for the most consistent progress.

The "lineup" against the heart diseases, for example, may include investigators from many different disciplines, such as:

Anatomy	Hematology	Physical biology
Biology	Industrial hygiene	Physics
Biostatistics	Microbiology	Physiology
Chemistry	Nutrition	Psychiatry
Electrocardiography	Pathology	Rehabilitation
Electronics	Pharmacology	Roentgenology
Epidemiology	Physical anthropology	Social anthropology

At Public Health Service's National Institutes of Health, the research team of the National Heart Institute laboratory of chemical pharmacology calls upon many different skills in studying the fate of drugs in the body. Here the observations of the basic chemical and physical sciences are blended in developing methods for the estimation of drugs such as the barbiturates, local anesthetics, narcotic analgesics, dicoumarin-type anticoagulants, anti-inflammatory agents, sympathomimetic amines, and adrenergic blocking agents.

Electronic instruments, such as the spectrophotometer, may aid in measuring quickly and accurately as little as a millionth of a gram of a drug in a few drops of blood.

Involved in this laboratory and clinical study are biochemists, pharmacologists, physiologists, nurses, physicians, rehabilitation workers, roentgenologists, and others. Investigators may employ methods as old as science, along with modern radiochemistry. In the latter, the isotope labeling technique has been successfully applied, for example, to study the complete fate of pentobarbital in the body.

The goal in these studies is to find how certain drugs may be administered for maximum therapeutic effect, and to develop clues to more effective compounds, with blueprints for the synthesis of some of these. Chemical pharmacology is but one of the areas where research teamwork is advancing public health.

## frontispiece . . .

In the upper left photograph, a doctor, studying under the research fellowship program of the National Heart Institute, observes the Van Slyke method of measuring the amount of gas present in blood samples. At upper right, investigators at the National Heart Institute laboratory of chemical pharmacology prepare apparatus for recording changes in blood pressure that result from use of experimental drugs. In the center, a young laboratory technician adjusts the chemical apparatus. At lower left, two research scientists discuss a cut-away model of the heart, while interpreting graphic findings related to heart physiology. At lower right, an investigator tests an experimental method of recording density changes and motions of the heart revealed by the electrokymograph.

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PUBLIC HEALTH MONOGRAPH No. 15 . . . Records and reports of local health departments.

*Olive G. Johnson.*

89 pages and illustrations. A summary and information on availability appear on pages 1078-1082.

PUBLIC HEALTH MONOGRAPH No. 16 . . . Dental, eye, and preventive medical services.

*Selwyn D. Collins and F. Ruth Phillips.*

28 pages and illustrations. A summary and information on availability appear on pages 1115-1116.



# PUBLIC HEALTH REPORTS



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# Gamma Globulin in a Poliomyelitis Outbreak In Montgomery, Alabama, 1953

By D. G. GILL, M.D., Dr.P.H.

**M**ONTGOMERY, the capital of the State of Alabama, is located in the County of Montgomery. Together they have a population of approximately 140,000, with the city accounting for 110,000 and the rural areas accounting for the balance. A well-organized county health department serves the health needs of the combined area.

This was the setting for the first mass use of gamma globulin under the 1953 national allocation plan in an attempt to stop a threatened epidemic of poliomyelitis. Early in 1953, cases of poliomyelitis were recognized in Montgomery, but there was no indication of serious trouble until the month of June brought reports

of 55 cases to add to the 30 cases already recorded. Earlier experience in Alabama revealed that 15 percent of the cases normally occurred prior to July 1, so that the area readily met the criterion of a projected rate of 300 cases per 100,000 population by the end of the year.

Request that Montgomery and Montgomery County be permitted to use gamma globulin came from Dr. A. H. Graham, the county health officer, and his board of health, consisting of five of the leading physicians in the city. With the assurance that 250,000 cc. of gamma globulin could be made available, it was decided on Friday, June 26, 1953, to attempt the task of mass injections. Past experience in conducting mass surveys for tuberculosis and mass blood tests for syphilis led to the belief that a mass gamma globulin inoculation program could be undertaken.

It was felt that not only did the situation demand immediate action but that the program should be finished by July 4. Accordingly, the period June 30-July 3 was selected for actual injections. The combined resources of the Montgomery County Health Department and the Alabama State Health Department were merged into one unit, which functioned as such, and assignments were given to key personnel.

## Calling the Alert

Some of the steps taken and the reasoning behind them are summarized as follows:

---

*Dr. Gill, the State health officer of Alabama, took his doctorates in medicine and in public health at the University of Toronto. He joined the Alabama Department of Public Health as epidemiologist in 1925 and became director of the bureau of preventable diseases in 1928. During the war, he served as medical director of the Alabama Selective Service. In addition to holding an associate professorship in public health at the University of Alabama, Dr. Gill is chairman of the Committee of Epidemiologists, Association of State and Territorial Health Officers, and associate editor of the Journal of the Medical Association of the State of Alabama.*

*On p. 1025, another facet of administering gamma globulin on a mass basis is described in detail.*

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**Flow chart of typical gamma globulin administration procedures used in Montgomery, Ala., mass inoculation program. Clinics were held in the public schools; 800 volunteer workers were recruited. AT ENTRANCE. 1 clerk assigns clinic numbers to families, who are asked to be seated in the school auditorium and to leave 1 seat between each family to prevent contagion. AUDITORIUM. 1 clerk calls families by number, in turn.**

A mass meeting of physicians was called for the night of June 26. It was attended by almost every physician in the area. The response was unanimous, and the physicians agreed to work on any schedule assigned to them. It was agreed that inoculations should be performed only by physicians since the possibility of accidents and reactions could not be overlooked. Not once did the pressure of private practice prevent the complete staffing of all clinics. The furnishing of lollipops at each clinic was suggested by one physician and was carried out by the physicians themselves.

Nurses were needed in numbers at least equal to physicians. Since it was early apparent that sufficient local nurses were not available, the director of nursing for the Alabama State Department of Health was made responsible for procuring additional nurses to assist in the clinics. Fifty county health nurses from all over the State were ready for duty in Montgomery by Monday morning, June 29. Many brought their own scales since weighing was on the list of musts.

#### *Volunteer Groups*

An unknown number of volunteers were needed, and the responsibility of obtaining and assigning them to duty was a formidable task. The parent-teachers' association was requested to take on this responsibility because their organization cut across all social and economic lines and because schoolhouses were to be used as clinic points. Between Saturday morning,

June 27, and Monday morning, June 29, 600 of the eventual 800 volunteers were recruited and brought to a mass meeting at the city hall where already-appointed team captains enlisted the numbers each needed and began the assignment of work hours and particular tasks.

Throughout the mass program, all matters pertaining to volunteers were referred to the PTA organization, which saw to it that enough people were on duty at each clinic. Their members obtained lunches for the workers who were unable to leave at mealtime. They made arrangements with the police and fire departments, the sheriff's office, the transportation companies—anything that could be handled by a nonprofessional staff was done and done expeditiously.

Technical details of syringe and needle sterilization—as needed originally and as needed for re-use—were handled by the laboratory staff of the State health department. Cleaning syringes and autoclaving ran far into the nights.

#### *Medical Corpsmen*

Montgomery has two Air Force posts, at Maxwell and Gunter Air Force Bases. Because neither field could obtain globulin supplies through Service channels promptly, both were included in the overall planning. Not only did the posts do their own inoculating, but they also furnished physicians and nurses for the city clinics. Another and extremely valuable contribution was made by a large number of



**REGISTRATION.** 2 clerks handle details of registering children. **WEIGHING ROOM.** 4 clerks are busy: 1 weighs the child; 1 records the weight and the amount of gamma globulin dosage; 1 escorts the family to the treatment room; and 1 maintains an even flow of patients. **TREATMENT ROOM.** Of the 10-15 aides, 4-6 remove pants, 4-6 stain buttocks, and 2-3 wash syringes.

medical corpsmen who proved adept at handling the unruly few and who gave assurance to many of the timid.

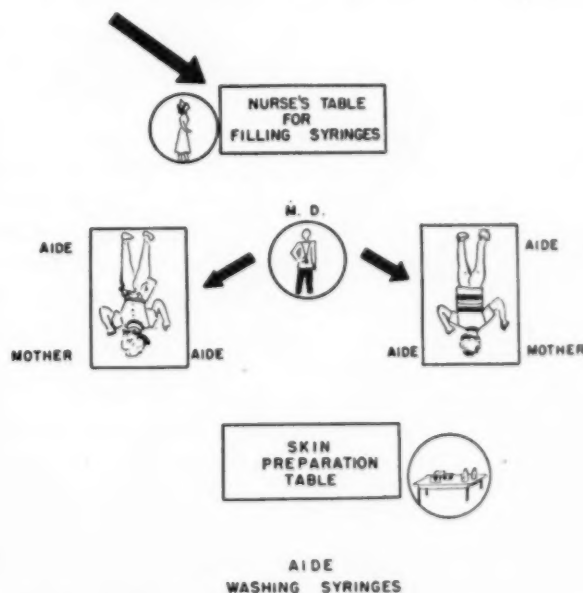
Public relations was an important consideration. Montgomery has 2 daily papers, a weekly paper, 6 radio stations, and 1 television station. In addition, the national news agencies, the newspapers from surrounding cities, national magazines and national radio, newsreel, and television companies were all intensely interested in the progress of the program. The offer of the Governor to utilize the facilities of the State's public relations bureau was gratefully accepted, and, insofar as possible, all releases were made through that agency. Montgomery citizens had been reaching a stage of severe apprehension, but the full coverage given by all agencies and the knowledge that something was being attempted served to allay hysteria and led to an intelligent support of plans.

The thousand and one details of planning clinics, procuring equipment and supplies, training personnel, and seeing that everything functioned smoothly was the task of Dr. W. H. Y. Smith, director of the bureau of preventable diseases in the State health department, and his staff of trained workers. The staff members who had been conducting X-ray surveys or blood tests applied the same techniques to handling the organization and the unification of diverse groups into a functioning whole. After the first hour, clinics operated smoothly, efficiently, and with a minimum of trouble. A

central headquarters with a battery of telephones was the nerve center of the mass inoculation program.

#### Almost 33,000 Inoculations

The details of actual administration were not too difficult. Twelve schools in the city and six in the county were chosen. All were open from



**TREATMENT ROOM DIAGRAM.** Chart shows arrangement of tables for inoculation teams, Montgomery, Ala. Usually, several physicians were on duty, each working with a separate table arrangement.

8 a. m. to 4 p. m., and a number were held open from 6 to 8 p. m. to accommodate working parents.

To avoid overcrowding it was necessary to allocate family groups to separate days. The Montgomery telephone directory, when divided into quarters, indicated that families might be similarly divided according to their surnames. Thus, all whose family names began with the letters A-F were asked to come on Tuesday, June 30, G-L the next day, M-R the third day, and the balance on the last day, Friday, July 3. Actually, of course, the first day was the heaviest, partly because some families were leaving town over the Fourth of July.

The general flow of clinic procedures and the arrangements for a treatment room are shown in the charts. In actual practice, sev-

eral physicians were frequently on duty, each with the setup shown. The arrangements for registration, weighing, and figuring the dosage of gamma globulin were sufficient, however, to prevent any delays in this part of the program.

During the 4-day period, June 30-July 3, 32,948 children, 9 years or under, received a gamma globulin dosage of 0.14 cc. per pound of body weight. Because the 1950 census had reported about 30,000 children at that time in this age group, we believe that the coverage approached 100 percent. The average dosage was about 6 cc. so that the supply of gamma globulin available was ample for this group.

The successful completion of a major undertaking on short notice is a tribute to the citizens of the community and to the staffs of the combined health departments.

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### Excerpta Medica Adds New Cancer Section

A new section on cancer, containing abstracts from medical journals of the world covering cancer and related fields, has been added to *Excerpta Medica*. Forming section XVI of the internationally known abstracting service, volume 1, No. 1 of the new periodical is dated July 1953.

Publication of a section devoted entirely to cancer has been under consideration for some time by editors of *Excerpta Medica*. Abstracts of all articles appearing in the international medical press concerning cancer previously were divided in the 15 sections of *Excerpta Medica*. Now this medical literature will be available to physicians in a single volume. The project was made possible through the aid of grants from the National Cancer Institute of the Public Health Service and the American Cancer Society.

The section on cancer carries 25 classifications. Abstracts of 424 articles falling into 14 of these classifications appear in the first issue. It will be published monthly and will contain 700 to 800 pages of abstracts a year. An index of authors will appear each month, and a classified subject and authors' index will appear annually.

The new publication is published in Amsterdam, as are other sections of *Excerpta Medica*, and has an editorial board composed of 32 members in addition to the two chief editors, Dr. R. van Dam and Dr. W. van Westering of the Netherlands. Twenty-two members of the editorial board are in America. Nine of the other members are divided evenly among nine western European countries, and one member is in India. National Cancer Institute members of the board include Dr. John R. Heller, director, Drs. Raymond F. Kaiser, Ross C. MacCardle, and R. R. Spencer, the last a former director of the National Cancer Institute, now retired.



# Organizing Mass Gamma Globulin Clinics In Three North Carolina Counties

CHARLES M. CAMERON, Jr., M.D.

SOME 30,000 children were inoculated with gamma globulin on a mass basis in three western North Carolina counties during the period from July 6 to August 7, 1953. Inoculations were given in Caldwell County on July 6, 7, and 8, and 12,800 children were processed in the 3 days. Catawba County was the site of a 3-day inoculation program on July 15, 16, and

17, at which time 14,761 children were given gamma globulin. In Avery County, during a 2-day program on August 6-7, 3,092 children were inoculated. The pattern developed for operating the mass gamma globulin clinics in North Carolina has proved to be highly effective.

This discussion outlines the purely administrative aspects of formulating and operating a globulin mass inoculation clinic. The criteria which must be fulfilled by a county prior to receiving globulin from the Office of Defense Mobilization varied according to the amount of globulin available, and these, accordingly, are not included.

---

*Dr. Cameron, as chief of the communicable disease control section, division of epidemiology, in the North Carolina State Board of Health, was in immediate charge of organizing the mass globulin clinics in the three North Carolina counties where poliomyelitis in epidemic form was prevalent during July and August 1953. For a report of how Montgomery, Ala., handled a threatened epidemic, see p. 1021.*

*After receiving his medical degree at Vanderbilt University Medical School in 1948, Dr. Cameron served as district health officer with the Tennessee State Health Department, from 1949 to 1951. During the next 2 years, he was assigned as a Public Health Service commissioned officer to the Branch of Health, Bureau of Indian Affairs. Dr. Cameron has been attending the School of Public Health, University of North Carolina, where he has completed work on his master's degree in public health.*

*A manual based on the operations described in this report has been distributed to all local health departments in the State.*

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## Sequence of Events

The timetable of events in each of the three North Carolina programs broadly assumed the following sequence:

The county medical society unanimously asked the local health department to forward to the State health officer a request that the county be considered for the mass use of gamma globulin. On the basis of the age distribution of the poliomyelitis cases reported up to then, the society also set the age limits of children who would receive globulin—usually all children between birth and 10 years.

The local health officer forwarded the request and an estimate of the number of children in the selected age group. The estimate was ob-

tained from census reports, birth rates, and death rates. To determine a county's eligibility, it was necessary for the health officer to supply the following additional data to the State health officer: total number of cases with age distribution; onset of cases by day; number of deaths from poliomyelitis; ratio of paralytic cases to nonparalytic cases; and number of respirator cases.

The request was reviewed by the State health officer. Upon approval, it was telephoned to the Public Health Service in Washington, D. C., acting as the allocation agent for the Office of Defense Mobilization, which advised that globulin would be granted, how much would be available, and when it would reach the county. This information was immediately transmitted to the county health officer.

The North Carolina State Board of Health, either from the central office or directly from the field, contacted the New York office of the National Foundation for Infantile Paralysis and informed it of the gamma globulin grant to the county and the estimated number of children to be inoculated so that a sufficient supply of needles and syringes could be sent. The Foundation shipped by air express directly to the county these and the other supplies it provided.

The globulin was shipped directly by air from the manufacturer to the county health officer.

The local health officer then had the responsibility for determining the number and schedule of clinics necessary to cover his county. To do so, he considered the availability of physical facilities such as schools for suitable clinic sites; the population distribution within the county; routes of transportation and communication; and the general availability of transportation; and the number of local physicians, nurses, and nurses' aides available to staff the clinics.

At this point, the following necessary efforts were carried out simultaneously. The State board of health was requested to recruit any additional physicians and nurses who might be needed to staff the clinics. The organization for local lay workers was set up, and the recruiting of the volunteers was started. The supply and equipment items to be obtained locally were

listed (see minimum list), and procurement was begun. Public relations outlets such as press and radio were alerted, and arrangements were made for the regular release of pertinent information, particularly within the county.

Once clinic sites were agreed upon, it was necessary to see that tables and other fixtures were available and that water, lights, refrigeration, and telephones were in operating condition.

Two nights before the opening of the clinics, a mass meeting of all volunteer workers was held at the clinic at which they would serve. At that time, job assignments were made, and the techniques of clinic operation were outlined. The National Foundation for Infantile Paralysis assisted in the orientation of lay volunteers by showing the movie "Marbles and Lollipops."

On the day before the beginning of the clinic operation, supplies were moved to the clinics from the central supply depot. The gamma globulin, however, was kept under refrigeration until the day the clinic opened. Globulin must be stored and maintained at 40°-50° F., and appropriate storage facilities in the county had to be obtained.

As they were recruited, local professional personnel were assigned to the respective clinics. As the outside professional personnel arrived, they were assigned living quarters by the health department staff member in charge of housing professional workers. They also were assigned to work in the respective clinics as they arrived. Arrangements for transportation to the clinic sites were completed with the motor pool.

#### **Administration and Operations**

The county health department was the official agency in charge of all operations within the county. The local health officer of the respective counties was in charge of the entire mass inoculation operation within the county. He worked directly under the supervision of the local board of health and was assisted by a poliomyelitis committee of the local medical society and by the chief of the communicable disease control section of the North Carolina State Board of Health's division of epidemiology. With the aid of his staff and consult-

ants, he made the decisions as to the sites, scheduling, and operation of the clinics.

The recruitment and scheduling of local professional personnel in two counties was handled directly by the health officer or by a health department staff member; in another, they were the responsibility of a member of the poliomyelitis committee of the local medical society. Both systems worked equally well. The recruitment of additional professional workers from outside the county was handled in every instance by the State board of health; and the housing and scheduling of these workers was handled by the local health department staff. The sched-

uling and handling of lay workers was delegated to a lay chairman and his associates.

Because of the complexity of the organizational and operational setup of the mass inoculation program, the entire time of the local health officer and of the State consultant was required to keep the clinic program operating smoothly. When actual operations began, 1 of these 2 individuals remained on duty at the command post at all times. The other circulated from clinic to clinic, generally supervising field operations.

Keeping the distribution and flow of supplies continuous was a difficulty. Because the ratio

### Minimum equipment and supplies for each gamma globulin clinic, North Carolina, 1953

Equipment	Supplies	Supplies—Continued
14 30" x 5' x 6' cafeteria-size tables.	Syringes $\frac{3}{4}$ 10 cc.; $\frac{1}{4}$ 5 cc. (at least 500 total). <sup>1</sup>	12 lead pencils.
4 3' x 4' tables (cafeteria tables may be used).	1 No. 20 or No. 22 needle per child (disposable). <sup>1</sup>	100 yds. masking tape ( $\frac{3}{4}$ ").
12 adult-size chairs for use at registration, and by recorders, nurses, and syringe-process workers.	12 pts. alcohol per 1,000 children.	2 boxes syringe cleaner per day. <sup>1</sup>
6 large waste cans.	4,000 cotton balls per 1,000 children.	4 globulin dose charts.
8 4' x 4' x 5' screens for use in screening registration and weighing desks from injection area (sheets suspended on wires may be used).	1 string tag per child.	2 pairs forceps.
10 blankets (8 for injection tables; 2 on first aid cot or table).	1 safety pin per child.	2 pairs pliers.
12 basins, pots, pans, etc., for syringe wash workers.	1 3" x 5" plain index card for registering each child.	
2 spring-type scales.	6 packages paper towels.	<b>Emergency Tray</b>
6 electric fans (4 for general use in clinics; 2 for drying syringes).	12 sheets for gamma globulin tables.	3 2 cc. syringes.
6 18" x 24" x 12" wire baskets (grocery store wire basket) for packing syringes before autoclaving.	100 paper cups.	3 No. 26 needles ( $\frac{3}{4}$ ").
6 soup bowls for alcohol sponges.	2 pairs scissors.	1 5 cc. syringe.
1 public address system.	1 6' x 30" width roll paper per child. <sup>1</sup>	3 No. 20 needles (1 $\frac{1}{2}$ ").
1 stethoscope.	18 yds. elastic tape per 8 injection tables.	1 10 cc. syringe.
1 blood pressure apparatus.	100 adhesive bandage strips.	1 No. 22 needle (3").
	1,000 rubber bands. <sup>1</sup>	6 ampules adrenalin.
	1,000 gauze squares.	6 ampules phenobarbital sodium.
	6 bars soap.	1 bottle Benadryl.
	1 gal. liquid detergent.	1 4-oz. bottle aromatic spirits of ammonia.
	500 envelopes or syringe wraps. <sup>1</sup>	1 doz. adhesive bandage strips.
	2 staplers (if envelopes used).	Alcohol sponges.
	Extra staples.	Tourniquet.
	1 syringe opener. <sup>1</sup>	
	12 red pencils for marking tags and gamma globulin dose.	<b>Other</b>
		Soft drinks for staff.
		Packaged crackers.
		Ice cream.
		Candy.
		Lollipops for children.

<sup>1</sup> Shipped air express by the National Foundation for Infantile Paralysis. Needles and syringes were packaged and autoclaved prior to use in clinics. The syringes, which were supplied on loan, were returned to the Foundation at the close of the program.



of children to the supply of syringes was high, it was necessary to clean, pack, and re-autoclave syringes while the operation was in progress. Local hospitals did all the autoclaving without charge. A supply depot was created at the local health department in each county. Supply transport corps were set up in two counties by the National Guard and in the third by volunteer workers.

In every county, communications between the clinic and the health center were maintained by telephone and by short-wave radio. The radio eliminated the overtaxing of telephone facilities at the health center. Radio sets and operators were volunteered by National Guard units and by other groups, and their location in the clinics and health centers greatly facilitated communications. This procedure is recommended for any operation of this type.

School lunchrooms were selected as the most suitable clinic sites. School authorities were most cooperative in making all facilities available. Usually, schools are located in centers of population, are easily reached by road, and parents were therefore asked to go to the clinic in the school nearest their home.

It was not considered feasible to attempt to assign the residents within certain geographic areas to any particular clinic, nor did it appear necessary to attempt to take various segments of the population on an alphabetical basis, chiefly because the amounts of globulin available were limited, and the supply was usually exhausted before the end of the scheduled operations.

#### **Role of the State Board**

In every county the program was recognized as one of local origin and as a local responsibility. The role of the State board of health in the clinics varied slightly from county to county. Briefly, the board:

Assisted the local health officer in the administration of the program.

Through the communicable disease control section of the division of epidemiology, supplied consultation to the local health officer in the organization, planning, and staging of the clinic.

Detailed a field epidemiologist to assist the

health officer in the investigation, collection, and tabulation of epidemiological data relative to the poliomyelitis outbreak.

Recruited professional personnel, both physicians and nurses, from other local health departments and medical centers in the State.

Served as the official channel of communication with the Office of Defense Mobilization, the Public Health Service, and the National Foundation for Infantile Paralysis.

Through the public relations officer in the Raleigh office, assisted in the release of public information about the incidence of poliomyelitis and the gamma globulin program.

Provided plans, program, and personnel for the evaluation of the possible effect of gamma globulin on the incidence of poliomyelitis; on the administrative aspects of staging a mass inoculation clinic; and on the allocation and distribution of gamma globulin.

#### **Clinic Organization**

A basic clinic unit was set up for all North Carolina clinics. Each unit consisted of a professional group and a lay group. The organization of each lay group was planned so that it was possible to process patients for one or more groups of professional workers. In smaller operations, the clinic staff was composed of 1 professional group and 1 lay group. In the larger operations, as in Catawba County, each lay group served 2 or 3 professional groups with ease.

#### **Professional Personnel**

All inoculations were given by physicians to avoid any criticism which might have resulted from any immediate or delayed untoward reaction to the injections. The basic professional operational unit was composed of 2 physicians, 1 public health nurse in charge, 5 registered nurses, and 4 nurses' aides.

At times, the nurses performed the aides' duties and also rotated jobs with the other nurses in the clinic. Four of the registered nurses checked the dose of globulin, which had been calculated at the weighing table, and filled the syringe with the correct amount. One registered nurse was assigned as a relief nurse to



circulate in each clinic and to supervise the cleaning and packing of syringes and the distribution of other supplies.

The aides' duties consisted of carrying the filled syringe to the injection table without contamination and assisting the physician by cleansing the skin.

A local public health nurse was assigned to each clinic and designated as the professional worker in charge of the entire operation. It was her responsibility to see that each worker performed his prescribed tasks, that supplies were sufficient, and that the clinic operated at maximum efficiency at all times.

Local physicians worked only 4-hour shifts because of their immediate responsibilities in the community. Physicians recruited from outside sources worked 8-hour shifts. The majority of nurses and nurses' aides in the local community were also used on 4-hour shifts, but nurses recruited from other county health departments or elsewhere usually worked at least 8 hours a day. The public health nurse in charge was on duty throughout the hours of clinic operation, either 10 or 12 hours, with only short periods of relief.

The assistance of all professional workers—physicians, nurses, nurses' aides—who were county residents was enlisted. At no time was there a sufficient number of professional workers present in the county to meet the staffing requirements of the program.

In the recruiting of additional personnel, the North Carolina State Board of Health played a key role in the staging of the globulin clinics. Working through its division of epidemiology, the State board of health contacted numerous county health departments throughout the State in the search for volunteer public health nurses who could be spared to participate in the mass inoculation programs. The response from the local health officers in making personnel available was excellent and indicative of the good neighbor policy which exists among health departments in the State.

The division of epidemiology also took the lead in contacting the three medical schools in the State in requesting that resident physicians assist in the administration of gamma globulin.

Duke University School of Medicine, the University of North Carolina School of Medi-

cine and Memorial Hospital at Chapel Hill, and the Bowman Gray Medical College and Baptist Hospital in Winston-Salem made physicians available to serve in the clinics. The globulin program would not have been possible without their assistance. In all North Carolina operations, professional workers volunteered their time.

#### **Volunteer Workers**

All volunteers needed to operate globulin clinics were recruited from the community in which the operation was staged. Persons under 16, pregnant women, and anyone suffering from acute or chronic communicable diseases were excluded from the volunteer ranks. All the workers served without reimbursement directly under the supervision of the chairman for each clinic.

The health officer named an overall chairman in each county to head the volunteer lay workers. He, in turn, named a chairman for each of the proposed clinics. The latter was responsible for recruiting and assigning volunteer workers to the various clinic shifts.

Often, these chairmen recruited the entire membership of various community clubs and organizations to serve on a given shift in the clinics. In the instance of a clinic scheduled to operate in the same site for more than 1 day, the same group was asked to work the same shift each day in order to reduce the confusion and time lost in reorienting lay workers.

The usual shift of duty for the lay volunteers was from 5 to 6 hours a day, since this group assisted prior to the daily opening of the clinic in distributing supplies and materials and remained for clearing up after the clinic closed.

A minimum of 40 volunteers was needed for each shift in each basic clinic unit. However, the single basic lay unit was able to handle the patient load for as many as 6 or 8 physicians and the corresponding number of nurses and aides. This was accomplished by adding one guide for each injection table added to the clinic.

In addition to the chairman of each volunteer unit, the basic minimum of 40 to a shift consisted of 2 hostesses, 10 guides, 2 clerks at the registration table, 2 weighers at the weighing



Left: Local nurses prepare gamma globulin ampules before the opening of the Lenoir (Caldwell County, N. C.) clinic. Above: Volunteer workers from the Caldwell County area receive instructions from their chairman before the program starts.

table, 2 clerks at the weighing table, 2 lifters (male) to pick the children up from the injection tables, 2 workers at the first syringe wash table, 4 workers at the second syringe wash table, 4 workers for the syringe drying, wrapping, and packing detail, 2 janitors, 2 policemen or others for directing traffic, 2 workers for distributing candy and other treats to the children, 1 worker to distribute poliomyelitis leaflets, 1 telephone operator, 1 telephone messenger, and 1 radio messenger.

#### Transportation Corps

The transportation corps was an integral part of the lay organization. It was responsible for transporting to and from the clinics any parents and children when they did not have the means of reaching the clinic; professional personnel, particularly those recruited from outside the county who lacked transportation or who were unfamiliar with the county; and lay volunteers when they had no means of reaching the clinic.

Organization and operation of the transportation corps was successfully delegated to a local club or organization, which called on automobile dealers, taxi companies, and other groups to supply automobiles and drivers.

Motor pool headquarters were set up away from the health center to reduce traffic and tele-

phone calls into the center, which usually served as a nerve center for the entire operation. The telephone number of the motor pool was widely circulated in the county.

The trucks, jeeps, and other vehicles needed to transport supplies and other materials to and from the clinic sites made up a separate unit of the motor pool. This supply transport unit usually functioned directly under the health department staff.

#### Public Information

Informing residents of the county about the details of the inoculative program schedule was not a problem in those counties with local radio stations and local daily newspapers. Avery County, however, does not have these outlets, and there the problem of informing the people was more difficult. For Avery County, then, these procedures were followed:

All telephone subscribers were called and advised of the clinic sites and schedules.

All persons on the tax rolls received a postcard giving the necessary information.

Posters and leaflets were prepared and distributed over the county.

All rural mail carriers were given the facts and were asked to spread the word along their routes.



**Above: A busy registration area in a typical clinic setup. Right: A boy at the Lenoir clinic gets his shot of gamma globulin. The physician inoculates; the aide holds the child; and the male volunteer, a local fireman, stands by to lift the child from the table.**



All ministers were asked to tell their congregations about the clinics.

The cooperation of two local political organizations representing the Democratic and Republican national parties was enlisted. They agreed to spread the word from house to house in the more isolated areas.

All volunteer clinic workers who attended the mass meeting 2 nights before the start of the program were asked to carry the word to their respective communities.

Newspapers from outside areas which circulate in the county and radio stations were asked to feature the news for Avery County residents.

Relations with the press proved to be an important phase of the operation. In two counties, all press contacts were made by the local health officer. In a third county, a lay worker with a newspaper background was placed in charge of the press releases. The former method was more effective inasmuch as it is sometimes difficult for a layman to interpret and translate medical concepts and ideas as effectively as a physician. In addition, it permitted the health officer to maintain the close supervision over the content of the press releases which is not possible with the latter method.

#### *News Releases*

Press and radio releases featured these ideas:

Clinics would remain in operation at all times during the scheduled hours and would continue operating until the inoculation of all specified children had been completed or until the supply of globulin had been exhausted.

Only children who were regular residents of the county or children of transients who would remain in the county for at least 21 days would be eligible to receive the inoculations. Injections would be limited to the stipulated age groups.

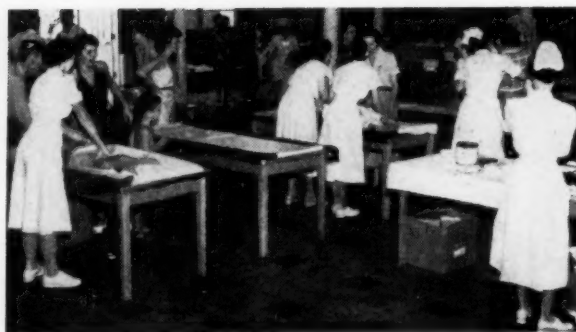
Globulin would be given to noncontacts of cases only at the mass inoculation clinics. None would be available for administering in the private physician's office.

Inoculations would be given on a first-come, first-served basis. Wherever possible, parents should take children to the clinic nearest their homes.

Contacts of poliomyelitis cases should go to the family physician to receive globulin from the local health department's supply which was earmarked for administration to contacts.

Every effort would be made to avoid crowding at the clinics. Children with communicable diseases should not be brought to the clinics.





**Left: A lull during the clinic procedure at the East Harper School, Caldwell County. Only 2 of the 4 injection tables are in use. Right: Peak of the rush period at the Harper School clinic. On the facing page at the left: Workers in the back of this cafeteria—school lunchrooms were used for gamma globulin administration in North Carolina—are wrapping syringes before autoclaving. The nurses in the foreground are filling syringes with immune serum globulin on the basis of weight-**

One parent could accompany each child through the clinic.

Children should be dressed as simply as possible to facilitate undressing on the injection tables.

All inoculations would be given in the right hip.

As to the question of exceptional children or those with chronic illness, crippling, or other conditions, the parent should consult the family physician if there were any doubt as to the desirability of having the child inoculated.

Gamma globulin is harmless in most cases. However, some few children might experience headache, fever, chills, pain, or swelling about the inoculation site. If these reactions occurred, the parent should consult the family physician.

#### **Clinic Procedures**

The North Carolina clinics were scheduled to operate for either 10 or 12 hours a day. Caldwell and Catawba County clinics inoculated from 9 a. m. to 9 p. m., requiring 3 shifts of workers each day. Avery County clinics were open from 10 a. m. to 8 p. m., and 2 shifts a day were used.

A hostess met the parent and child at the entrance of the building. She assigned each child a number in the order of arrival at the clinic. The number was written on a small tag, which was pinned to the child's back so that it would be seen when the child lay on the injection table. If the group waiting was a large one, the parent was asked to wait either outside the building or in the auditorium.

When this procedure was necessary, the children were called back to the clinic, over a public address system, in groups of 20. When the waiting line was small, the parent and child were sent immediately in to the clinic. There each child was met by a guide who escorted both child and parent through the complete clinic procedure.

The first stop for parent, child, and guide in going through the clinic was at the registration desk where a 3- x 5-inch index registration card was filled in with the child's name, age, sex, and race and with the parent's name and address. (Documentary evidence of age or place of residence was not required.) The number on the child's tag was recorded on the card.

The second stop was at the weighing table where the child was weighed, and the globulin dose was calculated from a weight-dose chart. The amount was entered on the registration card.

The card was then left at the nurses' table. Next, the child was taken to the injection table, placed on it, and undressed as much as necessary.

The nurse checked the calculated dose using a weight-dose chart, filled a syringe with the correct amount, and handed both the syringe and registration card to an aide who took them to the injection table where the child had been placed. By assigning each physician four injection tables, almost no physician-time was lost in getting children on and off the tables.

The syringe was handed to the physician by the aide who then returned to the nurses' table. After the physician had inoculated the child,





dosage data. Center: Another view of a boy receiving a shot of gamma globulin. The police sergeant standing at the foot of the injection table was one of the volunteer male lifters at the Lenoir clinic. Right: Volunteer aides in the Lenoir clinic wash syringes before they are repacked and autoclaved for the next day's operation.

he handed the syringe to the guide who gave it to the worker at the first syringe wash table. The guide then helped the mother dress the child and escorted them to the exit where the child was given candy and ice cream and the mother received a leaflet, supplied by the National Foundation for Infantile Paralysis, which explained gamma globulin.

The guide then returned to the entrance to meet another parent and child.

At the first syringe wash table, the syringe and needle were flushed with washing solution, the needle was removed, and the two parts of the syringe were dismantled and fastened together with rubber bands. After the syringes were soaked for 20 minutes in a cleaning solu-

tion, they were taken to the second wash table, where they were cleaned with a bottle brush, rinsed, and placed on a clean sheet to dry. Drying was hastened by having electric fans blow over the area. When dry, syringes were not reassembled but were either wrapped in a special wrapper or in a paper towel, or they were dropped into a small envelope. They were then packed in wire baskets and returned to the hospital for autoclaving.

The programs in each of the three counties worked smoothly and efficiently, without congestion at the clinic sites, and with highest praise from parents whose children were brought to the clinics for gamma globulin administration.

## Poliomyelitis Distribution In the United States, 1952

A record number of poliomyelitis cases were reported in the United States in 1952. The final figures show a total of 57,879 cases. This

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*Dr. C. C. Dauer, medical adviser of the National Office of Vital Statistics, Public Health Service, continues here the annual report series on poliomyelitis in the United States.*

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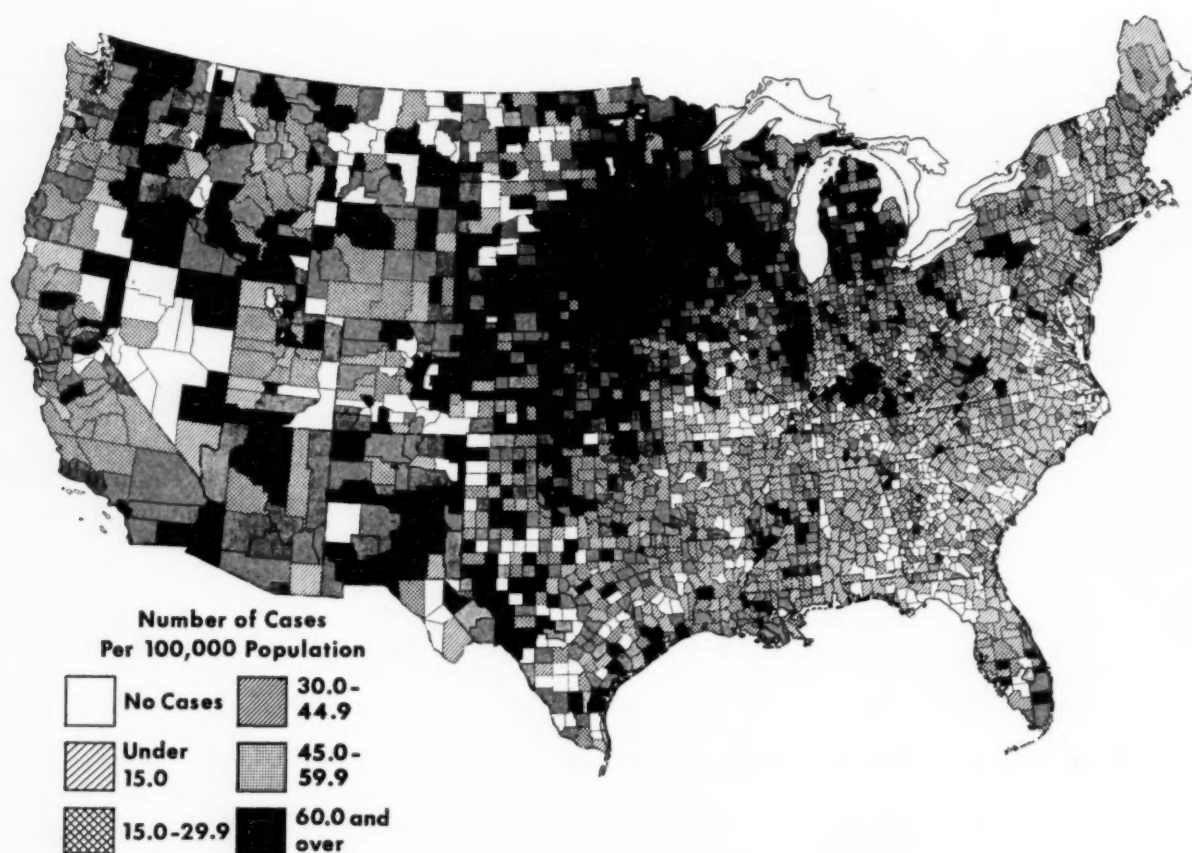
total is almost 38 percent higher than the previous high year of 1949, when a total of 42,033 cases was reported. The incidence rate in 1952 was 37.2 cases per 100,000 population, and the estimated death rate, based on a 10-percent sample of deaths registered, was 2.1. The estimated case fatality rate for the country as a whole was approximately 5 percent. Since 1916, when the rate was about 25 percent, the case fatality of the disease has declined grad-

ually. In the decade of 1930 to 1939 it was about 13 and in the following decade it was 7.5 percent.

Although Minnesota, California, Illinois, Texas, and Michigan reported the largest number of cases in 1952, the States which had the highest incidence rates were Nebraska with a rate of 163.9 cases per 100,000 population, South Dakota with 153.2, Minnesota with 136.7, Iowa with 134.7, and Kansas with 85.8. Nine other States in various sections of the country had morbidity rates in excess of 50 per 100,000.

As shown in the accompanying map the most extensive epidemic area extended diagonally across the United States from Minnesota and Wisconsin in the north to Texas and New Mexico in the southwest. Other smaller areas of high incidence are also shown.

About 37 percent of the total number of cases reported were classified as paralytic and 22 percent as nonparalytic. The status of the remaining 41 percent is unknown and is designated as unspecified.



Distribution of poliomyelitis in the United States, by county, 1952. This map is the 20th of the series showing distribution by counties in the continental United States. The first report appeared in Public Health Reports in 1938, and covered the years 1933 to 1937, inclusive, but subsequent reports have shown the distribution for single years. The series was begun at the suggestion of the late L. L. Lumsden, who was keenly interested in the geographic distribution of diseases, particularly tuberculosis.

# Case Finding Through Multiple Screening

By ARNOLD B. KURLANDER, M.D., M.P.H., and BENJAMIN E. CARROLL, M.A.

**D**URING the past few years, there has been a widespread interest in multiple screening—an approach to case finding characterized by the application, to apparently well populations, of a combination of screening tests for various diseases or conditions. Within a period of 4 years, multiple screening has been given extensive trial, has demonstrated its ability to find cases of disease, and has been hailed by some as an important new tool in public health work.

It is the purpose of the present paper to discuss the methods and results of some of the more extensive multiple screening projects, to consider certain principles and problems of this approach, and to stress some of their implications for the planning of screening projects.

The brief but active history of multiple screening includes at least nine major projects, ranging from pilot studies that have tested a few thousand screenees to local or Statewide operations that have screened tens, or even hundreds, of thousands of persons. Screening has been incorporated in such research studies as those planned by the Chronic Disease Research Institute in Buffalo, N. Y., and by the Commission on Chronic Illness in Baltimore, Md., and in Hunterdon County, N. J. The procedure was established on a continuing basis in Alabama and Georgia, and has been operated as an annual project in Alexandria, Va., for the past 3 years. In addition, at least 30 other

projects throughout the country have come to the attention of the Public Health Service.

Screening, using a combination of tests—although not always called “multiple screening”—has for some time been conducted by industries and labor unions. Some of this work—for instance, that done by the International Ladies Garment Workers Union—antedates the multiple screening projects operated by health departments.

To a limited extent, multiple screening has also been introduced into hospitals. At St. Michael's Hospital in Newark, N. J., several screening tests have been given to both inpatients and outpatients, with a significant return in newly discovered cases of previously unsuspected disease. Results of a cooperative project are now being analyzed, in which the District of Columbia's General Hospital and the Public Health Service screened outpatients to study case-finding possibilities. Some proponents of the multiple-screening approach recommend that all hospitals use screening as a general preventive medicine service, giving routinely such tests as height and weight, blood pressure, urinalysis, blood counts, hemoglobin, serologic test for syphilis, chest X-ray, and electrocardiogram.

## Results to Date

In the trial projects discussed above, multiple screening has shown definite promise as a way of discovering previously unrecognized disease. Nine of the major projects together have screened more than a million persons and have identified approximately 50,000 cases of disease and/or abnormalities. In all proba-

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*Dr. Kurlander is assistant chief of the Division of Chronic Disease and Tuberculosis, Public Health Service; Mr. Carroll, formerly a statistician in that division, is now with the National Cancer Institute.*

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bility, this number represents a considerable understatement of the true case finding accomplished, since complete reporting of diagnostic followup is lacking. Furthermore, some of the projects mentioned have included only 2 or 3 tests, rather than the usual battery of 10 to 12.

The project carried out through the Permanente Foundation, which screened about 4,000 longshoremen in the San Francisco Bay area, and which secured rather complete followup reports on the persons screened, discovered new cases of disease in 19 percent of the men screened. The Indianapolis, Ind., pilot study discovered new cases of disease in 10 percent of persons screened. This project, which screened an almost entirely Negro population group, applied most of the same tests that were used in the Permanente project but obtained no followup reports on abnormal weight, vision, or hearing. In Richmond, Va., 9 tests were offered to the general population and followup reports were obtained on a large number of screenees. An analysis of the total persons screened showed that about 5 percent of this total were found to have previously unknown disease.

Thus, in screening projects testing various segments of the population, 5 percent or more of those screened have been found to have significant disease that was previously unknown.

The combinations of tests used by nine major multiple screening surveys and research projects are outlined in table 1. The most commonly used tests in these projects have been chest X-ray, serologic tests for syphilis, and blood sugar determinations.

Details of the major multiple screening projects are shown in table 2, which gives a brief statement of the methods used, standards applied and results obtained. It is evident, even on casual inspection of this table, that there has been great variety on each of these points. As pointed out earlier, there was also variation in the population groups screened. Such considerations make it clear that the figures shown here should not be compared without attention to all circumstances.

Many of the available reports lack complete followup information covering the verification of screening results and the number of new cases actually discovered. Those projects using a long array of tests include those with the most complete followup studies.

It seems appropriate to consider here certain of the fundamental concepts involved in screening. Misconceptions as to basic points may lead to misapplication of methods and standards, and ultimately to the impression that the technique is without merit.

Table 1. Summary of tests used by 9 major multiple screening projects

Type of test	Project									Total
	Ala-bama	Alex-andria	Atlan-ta	Boston	Georgia Counties	Harnett County, N. C.	Indi-anapolis	Perma-nente	Rich-mond	
Cardiovascular history				(1)			X			1
Blood pressure		X		X			X	X	X	5
Electrocardiogram		X		X				X	X	4
Auscultation of heart							X			1
Chest X-ray	X	X	X	X	X	X	X	X	X	9
Serologic test for syphilis	X	X	X	X	X		X	X	X	8
Hemoglobin		X	X	X			X	X	X	6
Blood sugar	X	X	X	X	X	X	X	X		8
Urine sugar		X		X			X	X	X	5
Urine albumin		X		X			X	X		4
Height, weight, and build		X	X	X			X	X	X	6
Hearing		X		X			X	X		4
Vision		X		X			X	X	X	5
Intraocular tension									X	1
Self-screening history				X				X		2
Total	3	11	5	12	3	2	12	12	9	69

<sup>1</sup> Not included separately in screening line but covered by self-screening history.



**Table 2. Summary of tests and standards used on various multiple screening projects, with available results of screening and of cases discovered on basis of diagnostic followup reports**

Test, project, description, and standard for abnormality <sup>1</sup>	Number of persons screened	Percent abnormal on screening	Reports received		Estimated cases found <sup>2</sup>	
			Total cases	New cases	Total	New
CARDIOVASCULAR HISTORY:						
Boston—See Self-screening history.....						
Indianapolis—Questions by physician on chest pain, dyspnea, orthopnea, rheumatic fever, and/or history of high blood pressure or heart disease.....	5,706	30.8	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )
Permanente—See Self-screening history.						
BLOOD PRESSURE (STANDARD METHOD):						
Alexandria, Va. (150/100).....	6,151	11.0	{ 176 high 4 low ( <sup>5</sup> )			
Boston (Master et al.) <sup>3</sup> .....	4,536	14.3				
Indianapolis (150/90).....	5,711	25.7		( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )
Permanente (170/95).....	3,989	21.0		369	207	* 369
Richmond (150/100).....	37,442	14.6		1,306	162	2,584
ELECTROCARDIOGRAM:						
Alexandria, Va.—3 standard limb leads.....	6,027	7.0				
Boston—Lead I.....	5,057	( <sup>5</sup> )				
Permanente—3 standard limb leads and VI, V3, and V5.....	3,984	16.7	301	182	301	182
Richmond—12 standard leads.....	3,179	14.0	99	27	205	56
X-RAY, HEART—70 MM.:						
Alabama.....	168,290	.8	1,105			
Alexandria, Va.....	7,209	.4				
Atlanta.....	213,488	1.1				
Boston.....	4,536	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )		
Georgia Counties.....	213,542		1,964			
Harnett County, N. C. (No data on method).....	6,875					
Indianapolis.....	5,701	11.8	( <sup>5</sup> )	( <sup>5</sup> )		
Permanente.....	3,990	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )
Richmond.....	37,548	5.7	433	55	1,010	129
COMBINED CARDIOVASCULAR TESTS:						
Boston—ECG and X-ray.....	4,536	4.4	41			
Indianapolis—History, blood pressure, auscultation, X-ray.....	5,711	31.6	336	93	646	177
Permanente—Blood pressure, ECG, and X-ray.....	3,990		571	339	571	339
X-RAY, TUBERCULOSIS—70 MM.:						
Alabama.....	109,967	.5	198			
Alexandria, Va.....	7,209	2.0				
Atlanta.....	213,488	1.9	287	234		
Boston.....	4,536	.07	1			
Georgia Counties.....	213,542	1.3	182			
Harnett County, N. C. (No data on method).....	6,875	3.0				
Indianapolis.....	5,701	1.7	22	17	22	17
Permanente.....	3,990	4.2	* 74	* 33	* 74	* 33
Richmond.....	37,554	6.0	* 289	* 72	* 770	* 191
X-RAY, MISCELLANEOUS CHEST PATHOLOGY—70 MM.:						
Alexandria, Va.....	7,209	.1				
Atlanta.....	213,488	.3				
Boston.....	4,536		17			
Georgia Counties.....	213,542		1,626			
Indianapolis.....	5,701	2.7	* 36	* 8	* 40	* 10
SEROLOGIC TEST FOR SYPHILIS:						
Alabama—Kahn.....	221,312		4,747		4,747	
Alexandria, Va.—VDRL.....	2,504	1.5				
Atlanta—VDRL.....	228,024	9.8	11,671	2,245	11,671	2,245
Boston—Hinton.....	4,536	.2	5			
Georgia Counties—VDRL.....	244,493	9.9	12,520	6,965	12,520	6,965
Indianapolis—Mazzini.....	5,684	12.5	541	118	541	118
Permanente—VDRL or Mazzini.....	3,974	10.4	159	23	159	23
Richmond—Kahn.....	36,981	.6	168	50	169	51

See footnotes at end of table.



**Table 2. Summary of tests and standards used on various multiple screening projects, with available results of screening and of cases discovered on basis of diagnostic followup reports—Continued**

Test, project, description, and standard for abnormality <sup>1</sup>	Number of persons screened	Percent abnormal on screening	Reports received		Estimated cases found <sup>2</sup>	
			Total cases	New cases	Total	New
<b>HEMOGLOBIN:</b>						
Alexandria, Va.—Cyanmethemoglobin (12 gm.)----	2, 613	8. 7				
Atlanta—Copper sulfate (males 11 gm., females 10 gm.)-----	180, 128	5. 4				
Boston—Photoelectrometer (males 12.3 gm., females 10.3 gm.)-----	4, 536	4. 4	70			
Georgia Counties—Copper sulfate-----	225, 281	7. 0				
Indianapolis—Sheard & Sanford, with photoelectrometer (males 12.5 gm., females 11 gm.)-----	5, 694	16. 2	115	50	220	96
Permanente—Copper sulfate (males 12.3 gm.)-----	3, 986	. 1	1	1	1	1
Richmond—Dare hemoglobinometer (12 gm.)-----	37, 603	13. 2	1, 034	527	2, 111	1, 078
<b>BLOOD SUGAR:</b>						
Alabama—Modified picric acid (150 mg. % retest 180 mg. %, venous)-----	477, 846	6. 4	2, 032		4, 380	
Alexandria, Va., 1950—Modified picric acid (150 mg. %, venous)-----	2, 618	5. 7				
Alexandria, Va., 1951—Wilkerson-Heftmann (130 mg. %, venous)-----	3, 489	3. 2				
Atlanta—Anthrone (130 mg. %, later 170, venous)---	211, 639	3. 3				
Boston—Wilkerson-Heftmann (130 mg. %, venous)---	4, 532	3. 7	40			
Georgia Counties—Anthrone (170 mg. % under 2 hrs. postprandial, 130 mg. % over 2 hrs. venous)---	266, 432	3. 2				
Harnett County, N. C.—Wilkerson-Heftmann (130 mg. % fasting, 180 postprandial, capillary)-----	6, 197	2. 1	74	48		
Indianapolis—Wilkerson-Heftmann (130 mg. %, venous)-----	5, 695	2. 2	48	22	48	22
Permanente—Wilkerson-Heftmann (180 mg. %, 1 hr. after 50 gm. sucrose, venous)-----	3, 966	3. 9	55	33	55	33
<b>URINE SUGAR:</b>						
Alexandria, Va.—Benedict (1+ or more)-----	7, 136	3. 3				
Boston—Clinitest (trace or more)-----	4, 536	3. 4	6			
Indianapolis—Clinitest (trace or more)-----	5, 704	2. 0	53	24	53	24
Permanente—Benedict (2+ or more)-----	3, 987	5. 0	53	28	53	28
Richmond—Clinitest (trace or more)-----	34, 124	1. 5	145	51	274	97
<b>URINE ALBUMIN:</b>						
Alexandria, Va.—Acetic acid (1+ or more)-----	7, 159	1. 1				
Boston—Sulfosalicylic acid (no data)-----	4, 536		11			
Indianapolis—Heller ring test (positive or trace)---	5, 701	2. 2	33	10	33	10
Permanente—Sulfosalicylic acid (1+ or more)-----	3, 988	2. 3	35	16	35	16
<b>HEIGHT, WEIGHT, BUILD:</b>						
Alexandria, Va. 1950, 1952—Ideal weight tables <sup>9</sup> (10% variation)-----	3, 915	{ 29. 4+ 26. 2-				
Alexandria, Va. 1951—Ideal weight tables <sup>9</sup> (20% variation)-----	3, 511	{ 15. 8+ 8. 6-				
Atlanta—Standard weight tables <sup>9</sup> (25% variation)---	213, 488					
Boston—No data (20% variation)-----	4, 536	{ 27. 4+ 2-	347+ 0-			
Indianapolis—Ideal weight tables <sup>9</sup> ; later Pryor measurements <sup>10</sup> (22.5% variation)-----	5, 710	{ 13. 9+ 4. 7-	(17)	(17)		
Permanente—Ideal weight tables <sup>9</sup> (-25% and +40% from ave. for med. build)-----	3, 992	{ 9. 0+ . 03-	241	74	241	74
Richmond—Measured and recorded (no standard established)-----	(11)	(11)				
<b>INTRAOCULAR TENSION:</b>						
Philadelphia <sup>14</sup> —Schiotz tonometer (25 mm. or over)-----	9, 535	10. 2	<sup>15</sup> 217	<sup>15</sup> 217	217	217
Richmond—Schiotz tonometer (25 mm. or over)-----	6, 020	23. 8	65	33	130	65

See footnotes at end of table.

**Table 2. Summary of tests and standards used on various multiple screening projects, with available results of screening and of cases discovered on basis of diagnostic followup reports—Continued**

Test, project, description, and standard for abnormality <sup>1</sup>	Number of persons screened	Percent abnormal on screening	Reports received		Estimated cases found <sup>2</sup>	
			Total cases	New cases	Total	New
HEARING—PURE-TONE AUDIOMETER:						
Alexandria, Va., 1950, 1951 (30 db loss at 4,000 cycles; 20 db at 1,000, 2,000, 6,000 cycles)-----	6, 140	22. 8				
Alexandria, Va., 1952 (20 db loss at 1,000, 2,000, 4,000, 6,000 cycles)-----	1, 267	30. 0				
Boston (30 db loss in either ear at 500, 1,000, or 2,000 cycles)-----	4, 536	8. 2	27			
Indianapolis (30 db loss at 2 frequencies in 1 ear or 1 frequency in each ear: 500, 1,000, 2,000, 4,000, 8,000 cycles)-----	5, 650	19. 8	(17)	(17)		
Permanente (combinations of 20-60 db loss)-----	3, 992	12. 6	243	92	243	92
VISION:						
Alexandria, Va.—Sight Screener <sup>12</sup> (20/40 either or both eyes)-----	7, 338	26. 0				
Boston—Ortho-Rater <sup>13</sup> (Less than 20/40, near or far, either or both eyes)-----	4, 536	8. 9	65			
Indianapolis—Sight Screener (2 tests 20/40, or 1 test 20/50 either eye or both, near or distant vision)-----	5, 697	44. 5	(17)	(17)		
Permanente—Jaeger chart (Distant, 20/40; near, J-4 line either eye)-----	3, 972	23. 8	395	205	395	205
Richmond—Sight Screener (20/50 in either or both eyes)-----	7, 384	5. 5				
SELF-SCREENING HISTORY:						
Boston—222 questions similar to Cornell Medical Index-----	4, 536		18 474			
Permanente—Modified Cornell Medical Index-----	3, 994	(11)				

<sup>1</sup> Italicized text in stub indicates standard for abnormality.

<sup>2</sup> Estimated on basis of percent positive among diagnostic reports returned by physicians.

<sup>3</sup> See J. A. M. A. 143: 1464-1470 (1950).

<sup>4</sup> Where diagnostic reports were obtained for practically all persons referred, so that reported results represent total case finding, the figures for diagnoses returned are repeated in the columns for "estimated cases found."

<sup>5</sup> See "Combined cardiovascular tests."

<sup>6</sup> Includes all chest X-ray results. The 33 new cases include 6 of "active or possibly active" tuberculosis.

<sup>7</sup> Includes both active and inactive cases.

<sup>8</sup> Diagnoses include inactive tuberculosis.

<sup>9</sup> Tables of height and weight distributed by life insurance companies derive from the medico-actuarial mortality investigation of 1912. The tables of "standard weights" are based on averages of life insurance policyholders included in that study. The tables of "ideal weights" are based on the same study but show age and weight giving the lowest mortality expectation.

<sup>10</sup> Uses lateral thoracic diameter and bi-iliac diameter to determine body build. Method and tables of standards in: Width-Weight Tables, 2d rev. ed., by Helen B. Pryor, Stanford University Press, Stanford University, Calif.

<sup>11</sup> Not referred for this test.

<sup>12</sup> American Optical Company.

<sup>13</sup> Bausch & Lomb.

<sup>14</sup> Not a multiple screening project.

<sup>15</sup> Previously known cases were not screened.

<sup>16</sup> Number of conditions.

<sup>17</sup> No followup.

NOTE: Where no figures are given, no data were available.

### Screening vs. Diagnosis

The role of screening as a brief health examination in contrast to a complete checkup has been mentioned often in the literature, but the point is worth further emphasis. The antecedents of the screening approach are to be found in many forms of examination—com-

plete and incomplete, thorough and cursory—done for purposes of employment, life insurance, selection for military service, and school health. The deliberate combination of several rapid, simple tests for such specific purposes as case finding and health education is, however, characteristic of the present concept of multiple screening.

In the nature of the two processes and in the concepts involved, fundamental differences exist between screening and diagnosis. Screening attempts only to select high-prevalence groups through the application of standardized tests to numbers of people, with full realization that there will be "errors" in the form of false positives and false negatives. Diagnosis, on the other hand, establishes or rules out disease through a synthesis of the most complete and accurate information available about a particular individual. While each of these processes is appropriate in its place, they cannot be used interchangeably.

Important differences in details of application and interpretation naturally follow because of these fundamental differences. Screen tests are applied at random to the apparently well, whereas need for the diagnostic process is indicated in the presence of symptoms or suspicion of disease. Screening is impersonal in nature, and the result of each test is measured separately by a definite standard determined in advance and generally adhered to despite the results of other tests. Even where some subjective element enters (as in examining X-ray films for evidence of pathology) the interpreter of the test results tries not to deviate from a fairly definite set of criteria. In making a diagnosis, on the other hand, the results of tests are considered in relation to other factors, and individual judgment is an important aspect of the process. If these distinctions are not kept clearly in mind in carrying out screening, confusion results.

#### **Deficiency and Degenerative Diseases**

The fact that multiple screening is used to uncover deficiency and degenerative diseases as well as diseases caused by infectious agents poses another problem which at present does not lend itself to any perfect solution. For infectious diseases we have criteria by which screening can be judged, namely, whether the infectious agent is, or is not, present, either demonstrably or in its known biological manifestations. With deficiency or degenerative diseases, however, within the limits of our present knowledge, we are dealing with variations in physiological states that may occur normally in anyone. In this kind of situation, there is

no single "correct" standard or screening level, since we are measuring values along biological gradients, with a considerable range of normality.

Along such a scale the most accurate screen test does not usually point to definite disease as contrasted to definite absence of disease. Instead, we find a gradual transition up or down a scale from relative normality to relative abnormality. We cannot expect to determine either statistically or medically an exact point where the line between normal and abnormal is to be drawn. The problem is not one of the accuracy of tests alone. The screen test measures a particular physiological state at a given point in time, but diagnostic study is necessary to relate the finding in question to other pertinent factors in order to determine whether significant disease is actually present. That is why—be the screen test ever so accurate in measuring a condition—there is a substantial percentage of suspects whose ultimate diagnosis is negative.

As the screening level is moved further and further away from the average, smaller numbers of suspects are found, but the rate of diagnostic confirmation becomes greater. Two examples that follow illustrate concretely the manner in which this occurs. The examples are taken from results of screening 857 hospital outpatients for hypertension by blood pressure determinations, and 551 such patients for diabetes by means of the Somogyi-Nelson blood sugar test at various intervals after eating (including overnight fasting). All members of both groups received diagnostic study without regard to the screening findings.

The results found in blood pressure screening are illustrated in table 3. Here it is seen that about 70 percent of the screenees had test readings below 150 mm. systolic. Above 150 the percentages of screenees found at successively higher levels decrease rapidly until only 0.6 of 1 percent had readings of 250 and above. Referring to the third column of the table, we find that at this extremely high level 100 percent of the suspects were diagnosed as hypertensive. Reading up the column, we find successively smaller percentages of established diagnoses. With a screening level of 230 mm., 100 percent of the suspects would have been confirmed as

**Table 3. Percentage distribution of blood pressure readings on screening, and corresponding percentages of persons diagnosed as hypertensive<sup>1</sup>**

Systolic blood pressure reading (mm.)	Percent of persons with indicated reading at screening	Percent in each group diagnosed as hypertensive
70-89-----	0.3	0
90-109-----	14.2	0
110-129-----	33.6	3
130-149-----	21.6	26
150-169-----	14.8	52
170-189-----	7.5	78
190-209-----	4.4	89
210-229-----	2.0	94
230-249-----	1.0	100
250-269-----	.6	100
Total-----	100.0	-----

<sup>1</sup> Data from a cooperative screening project at the District of Columbia General Hospital, Washington, D. C., results of which have not yet been published.

positive, but a great many cases would have been missed. Conversely, if the screening level is lowered in an attempt to pick up additional cases, smaller and smaller percentages of confirmations will be obtained, and the cost of finding these cases will involve the referral and examination of many persons representing false positive tests.

A second example, using blood sugar values, is shown in table 4, where a striking parallel to table 3 is seen. Again we find decreasing percentages of suspects if successively higher values are considered as screening levels. Accompanying these decreasing percentages, the proportions of confirmations of diabetes increase from 0 for persons screened at less than 70 mg., up to 100 percent at 200 mg. per 100 cc. and over. The same reciprocal relationship is evident here as was pointed out in the preceding example. Lowering the screening level makes it necessary to process larger and larger groups of suspects with a decreasing rate of confirmation.

#### "False-Positive" Results

In populations where the prevalence of a disease is low, furthermore, significant percentages of false positives must be expected in screening, even where measurements along a range of values, or gradient, may not be involved. Suppose, for example, that screening is being done for a disease actually present in

**Table 4. Percentage distribution of blood sugar values on screening, and corresponding percentages of persons diagnosed as diabetic<sup>1</sup>**

Venous blood sugar value (mg. per 100 cc.)	Percent of persons with indicated value at screening	Percent in each group diagnosed as diabetic
30-49-----	0.4	0
50-69-----	12.5	0
70-89-----	51.5	.4
90-109-----	22.5	7
110-129-----	4.7	11
130-149-----	2.5	29
150-169-----	1.8	60
170-199-----	1.1	67
200-299-----	1.5	100
300-399-----	1.1	100
400-499-----	.4	100
Total-----	100.0	-----

<sup>1</sup> Data from a cooperative screening project at the District of Columbia General Hospital, Washington, D. C., results of which have not yet been published.

only about 2 percent of the screenees. In such a situation, let us assume a typical population of 1,000 persons, among whom 20 have the disease in question. Let us also assume a screening test which, applied to this group, will screen out 19 of the 20 diseased persons and only 19 others. Nineteen of these positives will then be verified by diagnosis and the other 19 will be diagnosed negative. Thus, 19 out of 38 screen positives are false, giving a "false-positive" rate of 50 percent. It would be a mistake, however, to condemn the screen test itself for this rate. Actually, a false-positive rate calculated in this manner is misleading, unless allowance is made for the fact that the rate depends on the prevalence of disease in the population screened. Nineteen of the twenty persons with the disease were properly classified by the test, and, therefore, sensitivity in this example is 19/20 or 95 percent. The specificity is 961/980, or 98 percent, since 961 of the 980 persons without the disease were correctly classified. Thus the screen test must be acknowledged to be highly efficient.

#### Planning the Project

The problems illustrated here lie at the root of much confusion regarding tests and standards, and have even cast doubt upon the feasibility of the screening approach in general. However, the same situation is faced in screen-



ing by any method that yields a wide range of values or deals with conditions of relatively low prevalence. It is more realistic and more productive—and in accord with medical traditions—to seek practical solutions to such problems, rather than to surrender for lack of perfect solutions.

Practical solutions must be sought in terms of the work involved in retesting and referral, the diagnostic workload that results from screening and retesting at any given level, and the resources required to meet the resulting diagnostic and care problems, as well as the costs incurred at each stage. The psychological effects upon the screenee cannot be overlooked. Particular care must be taken not to give him a false sense of confidence in the results of the screening test: He should be aware from the beginning that the screening is not a substitute for a complete health examination and that he is being tested for only certain specific conditions. Each local situation must be studied in the light of the possible effects of false positives and false negatives upon medical practice and on public reaction.

The local physicians and heads of clinics or hospitals, who will be expected to diagnose and treat the various conditions, should be included in the planning so that standards for screening, procedures and facilities for referral, diagnosis, treatment, rehabilitation, and education will be coordinated and have meaning for all concerned.

This cooperative planning should also deal with the problem of the person without frank disease who may have an abnormal condition in an early or incipient stage. Although frequently mentioned in the literature, such cases have not always been dealt with adequately in connection with screening programs. Decisions as to how this problem is to be handled have important implications for early case finding, for management of screenees and patients, and for the health education to be accomplished throughout the entire project. As indicated above, we can no longer think only in terms of the presence or absence of disease when dealing with deficiency and degenerative diseases. Many of the persons falling between the definitely normal and the definitely abnormal will not be regarded by their physicians as needing

medical supervision in the usual sense. The physician may, however, want to follow them because of the possibility of subsequent development of frank disease.

The objectives of a screening project should not only be discussed thoroughly and agreed upon definitely by those concerned, but should be expressed clearly in writing to avoid the possibility of later misunderstandings. Two major objectives—direct service to the public, and research—may be involved. If they are combined, each of these objectives will exert a limiting influence upon the other. Definite decisions as to the relative emphasis to be given to direct service and to research should be made in advance.

The kind of thorough planning indicated here for multiple screening and its ramifications will, of course, be familiar to those with experience in the public health field, since counterparts of the problems involved are found in the development of any public health program.

#### **Evaluation of Multiple Screening**

Although much progress has been made, multiple screening is still in an evolutionary stage. Screening and followup programs for syphilis and tuberculosis have been highly developed, but this is not true of screening for other diseases or for groups of diseases. Much remains to be learned through evaluation of multiple screening, in terms of accomplishments and costs of procedures to be followed at various stages from the original screening through the entire followup.

In the final analysis, of course, screening can be evaluated only by its results, such as reduced morbidity, disability, or mortality. Its ultimate value in the local community will be achieved as it becomes an integral part of a well-rounded chronic disease program, but on a limited scale multiple screening can serve to stimulate and guide the evolution of such a program.

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*A complete bibliography on multiple screening may be obtained upon request to the Publications Section, Division of Chronic Disease and Tuberculosis, Public Health Service, Washington 25, D. C.*

# Psychiatric Rehabilitation in the Hospital

By RICHARD H. WILLIAMS, Ph.D.

THE CONCEPT of rehabilitation is fairly clear-cut when one is dealing with amputees or with persons suffering from chronic neurological diseases. Everyone knows what is meant, and the results have been striking. But as the concept has become more generalized and is used to refer to still other diseases, including mental illnesses, it is not quite so clear.

Dr. Pearce Bailey has stated, "The current rehabilitation movement . . . is rooted in the concept that the mission of modern medicine must extend beyond definitive medical treatment to a program of dynamic therapeutics designed to bring the chronically ill patient to the highest functional level of physical, psychological, and socioeconomic adjustment compatible with his disability" (1). Such a program is limited only by maximal development of residual functions.

This statement is clear as to the objectives of rehabilitation. It is not, nor was it intended

to be, a definition because it does not delimit the process or operations involved. Furthermore, in a broad sense, all therapies have this same goal and may contribute to its realization. There has been considerable difficulty in demarcating a specific field of activities to be termed "rehabilitation," and there is some tendency to feel that rehabilitation is too loose a concept to warrant the development of a special program. On the other hand, there is a strong feeling that the goal of maximal development of residual functions requires a new orientation, the development of new techniques, and a new program if it is to be adequately attained.

## The Rehabilitative Process

Several characteristics tend to distinguish the activities of people engaged in rehabilitation. A rehabilitation worker is often said to engage in adjunctive therapy as contrasted with specific medical therapy. Specific medical therapy is designed to cure, arrest, or mitigate a specific disease entity. Adjunctive therapy assumes an end product of specific therapy and is designed to restore or readjust the patient to the most adequate level of functioning of which he is capable, given this end product.

Dr. Howard A. Rusk's frequently used phrase "the third phase of medicine" also suggests a distinguishing characteristic of rehabilitation in terms of time. The rehabilitative process generally begins after diagnosis has been made and specific therapy used. It might be better to distinguish four phases of medical practice: prevention, diagnosis, specific treatment, and

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*Dr. Williams is social science research consultant in the professional services branch, National Institute of Mental Health, National Institutes of Health, Public Health Service. As a sociologist, Dr. Williams has served on the faculties and research staffs at Johns Hopkins and Wayne Universities. In Paris, he was professor at the Center of Sociological Studies and director of a Bureau of Industrial Psychology. In this paper, Dr. Williams deals with the same field as the forthcoming Public Health Monograph No. 17 in which Charlotte Green Schwartz reviews the literature on rehabilitation of mental hospital patients.*

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rehabilitation. To be sure, no very sharp lines can be drawn in terms of time. All phases may overlap in many cases. Yet these phases are distinguishable, with general, average differences in time as one of the variables.

Another distinguishing characteristic of the rehabilitation process is that, in addition to the various adjunctive therapies which will vary from case to case, a complete approach must be used. The patient must be understood as a whole person in relation to his family, community, and job possibilities. As Rusk has stated, "If a man has a hearing disability, has lost a leg, or has a cardiac condition, his disability affects all phases of his life. It has a bearing on his vocational opportunities, his family, his social life, his recreation, and his mental and emotional outlook. Individual disabilities cannot be treated in rehabilitation; the whole man must be treated" (2).

At a discernible point the patient begins to get an "outside" orientation, and to think of himself as an "ordinary social person" rather than as a "patient." There is a problem of the best time and means to get him to this point and to keep him oriented. Also, there is a problem of getting the patient "over the hump." In other words, there are critical points in the total treatment process which need special attention. A part of the hump which the patient must get over results from the gap which generally exists between hospitals and the community. There is a problem of how or in what ways this gap may be bridged.

In short, patients have many needs which have not been wholly met in the traditional therapies. There is a problem, then, of determining what services can meet these needs and the kinds of people with necessary training required to perform them. Among these needs the patient's occupational role and other aspects of his social role are particularly important.

We suggest that "therapy" and "treatment" may be used as generic terms, and that rehabilitation is a special form of therapy, albeit relatively nonspecific and holistic in its approach. Rehabilitation is that form of therapy which is primarily concerned with assisting the patient to achieve an optimal social role (in the family, in a job, in the community generally), within his capacities and potentialities. Psychiatric

rehabilitation is the application of rehabilitative therapy, thus defined, to mental and emotional disabilities. These disabilities may be primary or secondary. In its developmental research program, the National Institute of Mental Health began with the primary disorders—the psychoses.

#### **Treatment a Continuum**

Total treatment may be viewed as a continuum, with specific medical therapies defining one end of the scale and rehabilitative therapies defining the other. The specific medical therapies are primarily (but not exclusively) concerned with helping the patient to recover from his illness. The rehabilitative therapies are primarily concerned with helping the patient live with his illness or its residue and helping him develop substitute capabilities and new adjustments as needed. The nearer one is to the specific medical therapies on such a scale, the more one is concerned with operations within a distinctly medical and protective setting. The nearer one is to the other end of the scale, the more one is concerned with the patient's ultimate adjustment in nonmedical settings in the community. In the field of mental disorders, at one end of the scale (deep psychotherapy) one is concerned with remodeling the patient's basic character structure, whereas at the other end of the scale, the primary concern is getting the patient to function in the social process, with the character structure which he has.

These two orientations do and should shade into each other in the total process of treatment. There is no sharp division between them on a basis of time, as it may be highly advantageous to develop the rehabilitative aspects during an early stage of treatment. There is no 1 to 1 correlation between type of personnel and type of treatment on this continuum. Psychiatrists can, and should, concern themselves with the full range of treatment problems, including rehabilitation. By and large, personnel concerned primarily with rehabilitation do not have the required training to engage in specific medical therapies, although it is advantageous if they have some understanding of these therapies and can communicate easily with physicians. Some therapists, notably occupational therapists, occupy an intermediate



position: to facilitate the specific medical therapy, as prescribed by a physician, and to facilitate the rehabilitation process. Possibly the term "adjunctive" therapies will be gradually dropped, because it gives the impression of something added on, secondary and expendable. They might better be called rehabilitation services and considered as an integral part of total treatment.

### **The Importance of Research**

Research in the field of psychiatric rehabilitation is in its infancy, but it has great potential importance for two basic reasons. In the first place, research is important operationally because it can lead to significant reductions in costs and wastage in the care of the mentally ill. As is well known, mental patients occupy more than one-half of our hospital beds, and the population in mental hospitals continues to increase—17 percent since 1939. There are a few private psychiatric hospitals, which provide good treatment and care, but they cannot possibly assume the whole burden of this large public health problem. State mental hospitals are generally overcrowded, and they are seriously understaffed.

There is considerable doubt as to the extent, if any, to which this increase is due to increases in the incidence of psychiatric disorders. Certainly, one of the major factors has been a series of changes in the organization and structure of the family, together with an increase in numbers of individuals who are detached and isolated from family groups. All of this has made it more difficult to tolerate and care for the mentally ill at home, individually and independently. Improved medical care has also reduced mortality rates in mental hospitals. Thus, the trend is toward higher admission rates and longer stay in the hospital, so that a large chronic population has developed.

It is not likely that a sufficient number of psychiatrists can be trained in the near future to meet the needs of the mentally ill for specific medical therapies. Given this situation, there is urgent need for research to determine the best ways to:

1. Prepare mental patients to live in less sheltered, less dependent, and less costly settings than the hospital.

2. Utilize all the hospital personnel, including psychiatric aides who have the most frequent contacts with patients, and utilize the entire hospital setting as a community to this purpose.

3. Mobilize existing resources in the community and create new, but less expensive, resources to maintain patients at an adequate level of functioning after they have left the hospital.

In the second place, research in psychiatric rehabilitation has a potentially significant contribution to make to basic scientific knowledge about mental disorders. Bailey (1) points out that the pathogenesis of neurological diseases is less well known than for other diseases. Hence there is more limited use of specific therapies and rehabilitation becomes all the more important. This statement applies equally well to mental illnesses. Furthermore, mental disorders, regardless of etiology, tend to involve disturbances in interpersonal relations and social adjustments in a direct way, more so than in most other illnesses. A significant proportion of mental disorders involve a failure of a person's system of behavior itself, rather than an inhibition of the system imposed by conditions stemming from the anatomical or biochemical systems of the organism—the "actor" is out of "whack," but the organism may be perfectly intact. Communication with others and emotional orientation to others are disturbed.

Rehabilitation of the mentally ill must thus be based primarily on an understanding of the emotional components of personality in the network of interpersonal relations, or, in other words, on the dynamics of social motivation. Research in psychiatric rehabilitation focused, as it must be, on ways in which patients may achieve an adequate social role and adequate functioning in the community, ways in which they may regain some interpersonal and social perspective, should contribute significantly to a basic understanding of this important component in mental disorders.

### **A Pilot Study**

The National Institute of Mental Health is currently sponsoring a pilot study in rehabilitation at the Boston State Hospital under the



general guidance of the superintendent. A research psychiatrist is project director, and psychologists, sociologists, and social anthropologists are used on the research and advisory staffs of the project. It is now in its second year of operation. Operations were necessarily on a small scale during the first year, and it is expected to run at least 2 more years.

The study encompasses an experimental group and a control group, with 30 men and 30 women in each group, selected from the reception service wards, and experimental and control groups, with 40 men and 40 women in each group, selected from the chronic service wards.

Control patients receive whatever service the hospital is conventionally able to provide, which is minimal. For example, on the chronic service wards for men there are 2 social workers, 3 occupational therapists, and 1 recreational therapist to cover the needs of 700 or more patients.

The experimental groups receive additional rehabilitation services from personnel assigned directly to the pilot study and from regular hospital personnel. These services include recreational therapy, educational therapy and counseling, hospital industry counseling, the services of a full-time vocational rehabilitation counselor, occupational therapy and social service. Also, an explicit attempt is made to bring physicians, nurses, and ward care personnel into the rehabilitation team.

However, the project has been explicitly designed with a relatively small number of additional service personnel (there are only four full-time service personnel attached to the project). We are convinced that rehabilitation services do pay off and that it is not necessary to make large additions to service costs. When the project was expanded in scope for the second year, additional research personnel but not service personnel were provided. The addition of research personnel bears a relation to "capital gains" to be derived from a project of this sort, which is quite different from the situation created by the addition of service personnel. Costs of additional service personnel would continue indefinitely in duplicated projects, whereas other hospitals can use the knowledge gained without having research costs. The

latter is a primary objective of the project.

Definitive results are not yet available. Indeed, definitive results cannot be expected for at least 2 more years, because one of the criteria must necessarily be the extent to which patients can maintain themselves more independently over a period of time. Some experts consider 5 years to be a minimum period for making this judgment. The project has, however, learned much about methods of research in rehabilitation and about operational problems which are likely to be encountered. This is a type of knowledge which would be very useful to persons who might wish to introduce either research or service programs in other hospitals.

### Considerations of Method

In a pilot research study, considerable time and effort must be spent to determine the methods of research which will be feasible within a given setting and which will most probably answer significant questions. In fact, one of the major purposes of a pilot study is to do just that and to pave the way for further and more detailed research. Six months were allowed for this purpose alone in the Boston State Hospital study before any of the action programs were initiated. As was expected, further experimentation with, and revision of, methods were necessary after the 6-month period.

Three major considerations of method, which would have to be faced in any study of a treatment program, have been explored:

1. Establishing experimental and control groups and the criteria for selection of patients in each.
2. Defining the variables to be measured or otherwise analyzed.
3. Selecting or developing tools for measurement or evaluation to obtain baseline data and later comparisons.

### Selection of Groups

The establishment and composition of experimental and control groups on the reception service wards presented no serious difficulties, because existing administrative practices could be readily used for this purpose. This service has 6 similar wards in a 3-story building. The

2 wards, one for men and the other for women, on the third floor were arbitrarily chosen for the experimental patients, and the 2 wards on the second floor, for controls. Patients are assigned to these wards by rotation on admission, so that the composition of the group is determined by chance. Only committed and voluntary patients were chosen, patients for whom there is no arbitrary limit on hospital stay, thereby excluding certain other categories which are admitted for restricted periods of observation. However, if patients in these other categories were subsequently transferred to a committed or voluntary status they were involved in the study. The groups are thus composed of the first 30 patients on committed or voluntary status to be admitted to experimental or control wards, starting November 1, 1952, making a total of 120.

The establishment and composition of experimental and control groups from the very large chronic population presented numerous problems. Development of feasible and suitable means to solve these problems was a major accomplishment of the study during the first months. The final result has utilized five major steps:

1. An "eligible group," was designated according to the basic criteria of: (a) not under current treatment for physical illness; (b) under 60 years of age; (c) hospitalized for at least 1 year in the current illness. These criteria do not imply that excluded cases are incapable of profiting from rehabilitation services, but only that they involve different problems in rehabilitation, and we wished to focus the study more specifically.

2. "Prospects" were designated within the eligible group. Prospective patients for rehabilitation services were selected by the chief psychiatrist of the service on the basis of his personal knowledge of patients, a check on patients recommended as prospects by other service personnel, and a careful screening of all patients on ground parole. Severity of illness, potential responsiveness to treatment, and potential for achievement after discharge were all considered. It was specifically decided to include some of the more seriously ill patients, whose chances for being discharged within 1 year would be slight, because one of the aims

of the study is to determine what types of mental patients can best profit from rehabilitation services, and, consequently, the range of types should not be arbitrarily narrowed in advance.

3. A "drawing group" was obtained by cross-classification of all prospects by the three criteria mentioned above. Each patient was rated on a three-point scale for each criteria. Twenty-seven cells were thus formed, and a random selection of patients from each cell, in proportion to the numbers in each cell, was made to obtain a drawing group of 40.

4. The 40 members of the drawing group were matched with 40 members of the remaining prospects, according to 10 indexes.

5. Members of the 40 matched pairs were assigned to experimental and control groups by chance.

Analysis of the data after the selection was made indicates that "eligibles," "prospects," and study groups are very closely comparable in terms of level of hospital adjustment, so that we are most probably dealing with a broadly representative sample of chronic patients. About 80 percent of the prospects manifest an active paranoid or schizophrenic process. Also, it was possible to achieve very close matching between experimental and control groups. It was desired to develop methods of selection for the study which can be duplicated, which will not deviate markedly from hospital administrative practices, and which do not involve the use of complicated or expensive instruments (the validity of which has not been proved for rehabilitation, in any case). The method established came closest to satisfying all these considerations. Its feasibility, however, is dependent upon having a chief psychiatrist who has had sufficiently long contact with the patient group and who can be given the extra time necessary to make the selection of "prospects" from "eligibles."

### Defining the Variables

Defining the variables to be studied also presents a crucial problem in any research program in rehabilitation. In a sense, our major variable is the introduction of a rehabilitation program in the experimental groups (and its

nonintroduction in the control groups), but it is apparent that this is a very complex variable indeed. Several rehabilitation techniques are being used. Also, and probably more important (for reasons to be indicated in another section), the study itself introduces new problems, new attitudes, and new interpersonal relations for all of the personnel. The problem of contamination of control groups is very real, especially in relation to the new attitudes which the study may generate. It would not be possible, short of an enormously complex and costly design, to isolate each aspect of the overall variable, a rehabilitation program, and study it separately under strictly experimental conditions. We do believe it is both feasible and potentially valuable to maintain the overall experimental design and then to develop accurate descriptions of the subvariables and intervening variables involved. For this reason primarily two full-time sociologists were added to the project staff. Undoubtedly, numerous subhypotheses will develop concerning the rehabilitation program which will lend themselves to scientific analysis now and possibly to experimental testing in subsequent studies.

### Evaluation Tools

The selection or development of tools for measuring and evaluating the patients' status and movement is largely a problem of providing sufficient time and personnel to give a series of psychological tests and to use a number of rating devices. We are exploring a new field of developmental research, and we are not sure which psychological tests have adequate predictive value for rehabilitation potential. Several rating scales of hospital and post-hospital adjustment have been developed in quite recent years, but further exploration is necessary to determine their usefulness in a particular research setting. Thus, within reason, the more instruments used, the better. Some of them will turn out to have sufficient reliability and validity to be useful and others can be discarded later on.

A battery of 7 or 8 psychological tests and several rating scales, some of which can be used under careful supervision by personnel engaged in ward care, are currently being used. Con-

sultant psychologists and an additional full-time psychologist were added to the staff of the study to strengthen this aspect of data collection. In addition, detailed records are kept of the type and amount of the services given to experimental patients. It has been recognized from the first that a better in-hospital adjustment can be a legitimate goal in rehabilitation, and a legitimate criterion of success of the program, even though the patient may not be ready for discharge. Not only is the patient "better off" in terms of broadly accepted human values, but also he creates less demands on the hospital staff, thereby lowering the costs of his care. Consequently, periodic ratings are necessary, and it would be misleading to rely on discharge rates as the sole index or even to give them special weight.

### Some Operational Problems

Numerous operational problems will be encountered whenever a new program is introduced into a large organization such as a State mental hospital. Both the formal administrative organization and the informal cultural atmosphere are likely to possess a certain rigidity and to be resistant to change. Two rather different attitudes may be taken toward such problems. On the one hand, they may be, and without great care are likely to be, regarded as "unenlightened" resistances to be overcome by all possible means. On the other hand, they may be regarded as representing very real forces in the social structure of the hospital, probably having important functional aspects, and, consequently, something to be understood, possibly modified, but not simply combated. The latter point of view has prevailed, wisely, we believe, in the Boston study.

Several of the operational problems encountered thus far revolve around the role of the ward physician. In the early stages of the study, it appeared that ward physicians were not making referrals for rehabilitation services (especially on the reception service wards) as frequently as would be expected or desired. Analysis showed that this was not due to blindly negative attitudes on the part of the physicians. They had suddenly been called upon to make a new type of referral and new



evaluations of patients for which they had not been prepared in their training, and no established routines existed. Also, examination of schedules revealed that the ward physicians did not have the necessary time to do the things they are supposed to do, according to general expectations. Furthermore, ward physicians are residents and are oriented toward their own training programs, which are heavily slanted in the direction of individual psychotherapy with patients (as a rule, with patients who are not on the same wards). The new rehabilitation program appeared as an additional hospital chore, taking valuable time away from training rather than adding to the value of the total training experience. The statement was made in a staff conference, for example, that if residents had a completely free choice they would not choose assignment to the experimental wards. Group conference techniques can, and have done, much to alter this pattern gradually, but it is deeply entrenched in the hospital culture and will have to be realistically faced in any rehabilitation program.

This example is but one of many of the general problems of facilitating communications and integrating a new program within the hospital. It has become a major goal of the pilot study to understand this problem as thoroughly as possible, rather than to treat it as a negative condition to be overcome, allowed for, or just tolerated. Such an orientation would certainly make it much easier to duplicate, in other hospitals, those phases of the action program which prove worthwhile.

### **Some Results From the Data**

As indicated previously, definitive results in the sense of evaluating the rehabilitation program as such cannot be expected in the first years of a pilot study. However, such a study does produce other kinds of results in the form of new knowledge that is useful for a variety of purposes. Sometimes the facts may not be entirely new or unknown, but the research on a new problem lends new perspective to them, or gives them a greater emphasis than they had before. A few examples of areas of knowledge gained thus far in the Boston study are cited briefly to illustrate.

The hospital has been more accurately informed concerning what has actually been going on in terms of releases. It was necessary for the pilot study staff to make statistical analyses of releases during a sample year, giving numbers released, location within the hospital prior to release, length of hospitalization, age, sex, type of provision for care on release and returns to the hospital.

The reception service handles "new" admissions, but it does not follow that these patients have recent or acute cases. In fact, less than 50 percent of this group in the pilot study had come into the hospital for the first time. Some of them had as many as nine previous admissions to mental hospitals. It is a group representing a very wide range of problems in developing and testing a rehabilitation program.

On the first trial run of selecting prospects among chronic patients from the eligible group, it was found that a surprisingly high proportion (roughly, 70 percent among the men) of the prospects had serious organic deficits along with their mental illness, including mental deficiency, alcoholism with organic residuals, and various pathologies of the central nervous system. On the other hand, they were people who caused little trouble in the hospital and who had made a reasonably good hospital adjustment as evidenced by ground parole and ability to perform some tasks in hospital industries. Further analysis raised serious doubts about their potential for adjustment outside of the hospital. Rehabilitation efforts in this direction might simply result in the transfer of a custodial problem from the hospital to some outside group. In any case, the group with serious deficits represents different and additional rehabilitation problems. Yet this is the group that hospital personnel tended to think of first as prospects for rehabilitation. These facts show that the selection of patients for intensive rehabilitation efforts is not a simple matter. In the Boston study there was need to broaden the base of selection so that an analysis could later be made of the most successful and the least successful types of cases.

It is known that the percentage of married patients in mental hospitals is low in comparison with the general population, but the extent of this difference is not often realized nor is its



importance sufficiently emphasized. About 70 percent of the male chronic prospects in the Boston study were "single." Thus, relations with a "family of procreation," that is, with a family in which one is a major responsible member (for example, husband and father), cannot be a part of the rehabilitation plan for many mental patients. The extent of the relation, and its potential usefulness, to a "family of orientation" (parents, siblings, or other relatives) is important to determine, as is the possibility of finding substitute groups for the family in many cases.

### Interpersonal Relations and Attitudes

Charlotte Green Schwartz (3), in an analysis of the literature on the rehabilitation of mental hospital patients, draws an important distinction between rehabilitation programs which focus primarily on the interpersonal relations and attitudes which come into play and result from activities in the program, and programs which focus primarily on the nature of the activities themselves. The latter emphasis tends to give major attention to the individual patient and the particular activities (for example, occupational therapy and recreational programs) in which he has engaged, whereas the former tends to give major attention to the whole context of social participation in activities regardless of their specific nature. The evidence is not all collected concerning the relative values of these two approaches.

The definitions and general perspectives on psychiatric rehabilitation, suggested above, in which the dynamics of social motivation and social reactivation are crucial, would favor the hypothesis that interpersonal relations and attitudes are more important than the intrinsic nature of the activities themselves. Sociological research in other areas, such as industry or the armed services, give credence to this hypothesis (4, 5). If proved generally valid, it would have important implications for the development of training programs for rehabilitation personnel. Perhaps what is needed is a generic program which has major emphasis on social and psychological dynamics and provision for internships in which dynamic principles could be applied. In addition, there could

be some specialization within the generic program on activities such as crafts, manual arts, music, drama, vocational development, and adjustment.

### The Mental Hospital as a Social System

There is growing awareness that the patterns of interpersonal relations and attitudes within an organization such as a hospital form a system, and that this system has profound effects upon all the participants. It controls and motivates their behavior to a very significant degree. Again, there is much sociological evidence concerning the nature and importance of this system in other fields, particularly industry and the armed services (4, 5). Schwartz (3) analyzes some of the quite recent studies of the social structure of the mental hospital, studies which are most challenging indeed. She also indicates, on the basis of evidence thus far, some of the characteristics of social structure which are presumed to be rehabilitative or vice versa, such as degree of democratization, effectiveness of channels of communication, and clarity of definition of functions.

One of the broadest visions of this range of factors and their potential therapeutic value has been developed by Dr. Maxwell Jones and his co-workers in England (6). They have also made one of the most explicit and thorough applications of these concepts in practice. A program for rehabilitation of the chronic unemployed with psychiatric difficulties has been established in the industrial neurosis unit at Belmont Hospital. So-called psychopaths and others with various disorders of character, usually termed "hopeless" cases, have been treated with better than expected success. This group is convinced that individual psychotherapy and hospitalization alone are not enough and that every aspect of the patient's life in the hospital community can and should be part of the total treatment program. Extensive use is made of conferences, discussion groups, psychodrama, and other forms of group participation. Explicit attention has been paid to the roles of physicians, nurses, and others on the staff and to the patterns of interpersonal relations and emotional dynamics which grow up around these roles. The constant aim is to integrate

these roles and to draw the patient into the total pattern, as a "therapeutic community," so that he can function more adequately in his social roles after discharge.

As this group clearly recognizes, every hospital has its social system, but much of it has been established on an intuitive or empirical basis, or has grown by the accretion of traditions. Efforts to direct the energies of the social system into therapeutic, including rehabilitative, channels should prove immensely fruitful. We are perhaps looking beyond the solid acquisitions of research, but we believe we are looking in a direction to which research already points the way.

### Summary

Rehabilitation has been defined as that form of therapy which is primarily concerned with helping the patient to function optimally in society, within his capacities and potentialities. Research on psychiatric rehabilitation has high potential value, both in relation to programs of treatment and in relation to basic scientific knowledge about mental disorders.

In a pilot study of psychiatric rehabilitation in the hospital, much has been and is being learned concerning methods of research, operational problems encountered, and various facts about the population of a mental hospital.

The importance of interpersonal relations and attitudes and the value of mobilizing the forces in the social system within the hospital for therapeutic purposes have been emphasized.

We believe we are entering a period in which this type of knowledge will be increased, and operational procedures for its use will be thoroughly established. It should be a period in which significant gains are made in the treatment of the mentally ill and in an understanding of mental disorders.

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*Details of the procedures used in selecting experimental and control groups from the chronic service wards can be supplied interested persons on request to the author.*

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## Dr. Brownell Named Commissioner of Education

Dr. Samuel M. Brownell, 53, widely known educator, was named Commissioner of Education in the Department of Health, Education, and Welfare by President Eisenhower on October 14, 1953. He will succeed Dr. Lee M. Thurston, who died September 4, 1953, after having been in office for only 2 months.

The new chief of the Office of Education has been president of the New Haven State Teachers College in Connecticut since 1947 and professor of education administration at the Yale Graduate School since 1938. Dr. Brownell also has been a visiting lecturer in educa-

tion at the Universities of Cornell, Harvard, Michigan, Southern California, and Wisconsin. A native of Peru, Nebraska, he was a graduate of the University of Nebraska in 1921. He received his doctorate at Yale in 1926 and for 9 years was superintendent of schools at Grosse Point, Michigan.

Dr. Brownell is president of the division of higher education of the National Education Association and has been a frequent contributor of articles to professional journals.

## Industrial Sickness Absenteeism

## Rates for Specific Causes in 1952 for the year and last two quarters

### Year 1952

#### Men and

#### Women

The 1952 rate for sickness and nonindustrial injuries among men is approximately the same as for 1951—130.9 and 131.2 absences per 1,000 men, respectively. With only a few exceptions, the 1952 rates for specific causes and the corresponding 1951 rates do not differ greatly (table 1).

Among women, the 1952 overall rate of 344.9 is 9 percent above the 1951 rate of 315.1. The rate for the nonrespiratory-nondigestive disease group is 27 percent above the 1951 rate.

A comparison of the rates for men and women in the broad cause groups shows that rates for women in the respiratory and the nonrespiratory-nondigestive groups are approximately three times the corresponding rates for men. For nonindustrial injuries and the digestive group the rates for women are only about half again as large as the corresponding rates for men. On the other hand, the men employees had higher rates than women in 1952 for tuberculosis of the respiratory system; diseases of

the stomach except cancer; hernia; and diseases of the heart.

#### Years 1943-1952

An inspection of the previously published year-to-year rates for the 10 years, 1943-52, disclosed for both men and women an upward trend in the frequency of sickness and nonindustrial injuries that began in 1950 and continued through 1952. The upward trend among women was more pronounced than among men. Indeed, the 1952 rate for women (344.9) was the highest of the 10 annual rates, exceeding the 10-year average (262.2) by 32 percent.

#### Frequency by Duration

During 1952 approximately 7 of every 1,000 men and 8 of every 1,000 women experienced an illness that caused them to be away from work for more than half of the year (table 2). These absences were due primarily to nonrespiratory diseases. For both men and women only one-fifth of the respiratory absences lasted more than 1 month, whereas, more than one-half of the nonrespiratory absences lasted more than 1 month.

#### Days of Disability

The disability rate of 6.6 days per man in 1952 corresponds closely with the rate of 6.4 in 1951. Women averaged 13.2 days of disability in 1952 compared with 11.9 in 1951, approximately twice as many days of disability as the men. Among both the men and women, more than half of the lost time was due to nonrespiratory-nondigestive diseases (table 3).

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*Prepared by W. M. Gajafar, D.Sc., in charge of the statistical services of the Division of Occupational Health, Public Health Service, this report continues the series on industrial sickness absenteeism. Data are derived from periodic reports of industrial sick benefit organizations and are limited to sickness and nonindustrial injuries causing absence from work for more than 1 week. The report for 1951 and the first half of 1952 appeared in Public Health Reports, March 1953, pp. 353-357.*

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**Table 1. Absences per 1,000 persons by cause—sickness and nonindustrial injuries disabling for 8 consecutive days or longer—years 1952, 1951, and 1943-52<sup>1</sup>**

Cause <sup>2</sup>	Number of absences per 1,000 persons beginning in specified period					
	Males			Females		
	1952	1943-52 <sup>3</sup>	1951	1952	1943-52 <sup>3</sup>	1951
<b>Sickness and nonindustrial injuries</b> .....	<b>130.9</b>	<b>123.2</b>	<b>131.2</b>	<b>344.9</b>	<b>262.2</b>	<b>315.1</b>
Percent of female rate.....	38	47	42	263	213	240
Percent of male rate.....						
<b>Nonindustrial injuries (169-195)</b> .....	<b>16.0</b>	<b>13.0</b>	<b>15.9</b>	<b>23.2</b>	<b>17.8</b>	<b>19.2</b>
<b>Sickness</b> .....	<b>114.9</b>	<b>110.2</b>	<b>115.3</b>	<b>321.7</b>	<b>244.4</b>	<b>295.9</b>
<b>Respiratory diseases</b> .....	<b>37.9</b>	<b>43.0</b>	<b>41.7</b>	<b>130.4</b>	<b>107.8</b>	<b>136.7</b>
Tuberculosis of respiratory system (13).....	.7	.7	.6	.4	.5	.5
Influenza, gripe (33).....	11.8	16.3	16.1	31.0	35.6	52.7
Bronchitis, acute and chronic (106).....	5.6	6.9	6.2	12.8	11.5	11.1
Pneumonia, all forms (107-109).....	5.4	5.3	5.8	5.5	4.4	7.7
Diseases of pharynx and tonsils (115b, 115c).....	3.9	4.5	3.6	17.7	16.4	14.8
Other respiratory diseases (104, 105, 110-114).....	10.5	9.3	9.4	63.0	39.4	49.9
<b>Digestive diseases</b> .....	<b>23.3</b>	<b>19.2</b>	<b>22.3</b>	<b>36.9</b>	<b>32.2</b>	<b>34.6</b>
Diseases of stomach except cancer (117, 118).....	7.2	6.2	7.0	4.5	3.8	4.5
Diarrhea and enteritis (120).....	3.4	2.5	2.9	12.0	7.3	9.6
Appendicitis (121).....	4.0	4.0	4.5	6.4	10.9	9.4
Hernia (122a).....	3.7	2.7	3.4	.8	.7	.2
Other digestive diseases (115a, 115d, 116, 122b-129).....	5.0	3.8	4.5	13.2	9.5	10.9
<b>Nonrespiratory-nondigestive diseases</b> .....	<b>51.0</b>	<b>44.3</b>	<b>48.1</b>	<b>148.9</b>	<b>99.1</b>	<b>117.6</b>
Infectious and parasitic diseases (1-12, 14-24, 26-29, 31, 32, 34-44) <sup>4</sup> .....	4.5	2.9	3.7	24.6	9.0	13.6
Cancer, all sites (45-55).....	1.0	.7	1.1	1.1	.7	.9
Rheumatism, acute and chronic (58, 59).....	3.6	4.4	3.5	5.7	4.7	4.4
Neurasthenia and the like (part of 84d).....	1.6	1.9	1.7	16.9	13.1	16.1
Neuralgia, neuritis, sciatica (87b).....	2.0	2.6	2.2	4.0	3.0	2.8
Other diseases of nervous system (80-85, 87, except part of 84d, and 87b).....	2.3	1.9	2.1	5.6	2.6	3.4
Diseases of heart (90-95).....	5.6	4.7	5.3	2.1	2.3	1.8
Diseases of arteries and high blood pressure (96-99, 102).....	2.4	2.3	2.3	2.0	1.5	1.5
Other diseases of circulatory system (100, 101, 103).....	5.7	4.4	4.9	10.1	6.7	7.2
Nephritis, acute and chronic (130-132).....	.4	.4	.4	.2	.4	.4
Other diseases of genitourinary system (133-139).....	5.3	3.7	4.8	31.9	23.0	30.5
Diseases of skin (151-153).....	4.0	3.6	3.6	6.6	5.7	4.9
Diseases of organs of movement except diseases of joints (156b).....	3.8	3.6	3.6	10.6	6.9	9.7
All other diseases (56, 57, 60-79, 88, 89, 154, 155, 156a, 157, 162).....	8.8	7.2	8.9	27.5	19.5	20.4
<b>Ill-defined and unknown causes (200)</b> .....	<b>2.7</b>	<b>3.7</b>	<b>3.2</b>	<b>5.5</b>	<b>5.3</b>	<b>7.0</b>
Average number of persons.....	176, 235	2, 189, 728	173, 853	15, 890	209, 468	15, 154

<sup>1</sup> Industrial injuries and venereal diseases are not included. <sup>2</sup> Numbers in parentheses are disease title numbers from International List of Causes of Death, 1939. <sup>3</sup> Average of the 10 annual rates. <sup>4</sup> Exclusive of influenza and gripe, respiratory tuberculosis, and venereal diseases.

**Men**  
**Last Half**  
**1952**

During the last half of 1952 the sickness absenteeism rate among men employees for the third quarter was 103.8 per 1,000 men and for the fourth quarter, 123.1.

While the fourth quarter rates are generally higher than those for the third quarter, the rates for 1952, for either quarter, are remarkably similar to the corresponding rates for 1951 (table 4).



**Table 2. Absences per 1,000 persons by duration—sickness and nonindustrial injuries disabling for 8 consecutive days or longer—year 1952**

Duration of absence in calendar days	Sickness and non-industrial injuries <sup>1</sup>		Nonindustrial injuries		Respiratory diseases		Nonrespiratory diseases <sup>2</sup>	
	Males	Females	Males	Females	Males	Females	Males	Females
8 or longer.....	149.9	347.0	15.3	23.6	43.9	127.7	90.7	195.7
8-28.....	87.4	207.6	8.3	12.1	35.4	102.1	43.7	93.4
29-56.....	31.0	74.8	3.6	6.3	5.5	19.0	21.9	49.5
57-91.....	14.1	35.3	1.8	2.8	1.4	4.1	10.9	28.4
92-183.....	10.5	21.4	1.1	2.0	.7	1.7	8.7	17.7
184 or longer.....	6.9	7.9	.5	.4	.9	.8	5.5	6.7

<sup>1</sup> Industrial injuries and venereal diseases are not included.

<sup>2</sup> Digestive diseases, nonrespiratory-nondigestive diseases, and ill-defined and unknown causes are included.

NOTE: Average number of persons: males, 55,506; females, 13,480. These workers are members of 10 reporting organizations paying benefits for 26 or 52 weeks.

**Table 3. Summary of disability data—sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer—years 1952 and 1951**

Cause <sup>1</sup>	Males		Females	
	1952	1951	1952	1951
Number of days of disability per person				
Sickness and nonindustrial injuries.....	6.6	6.4	13.2	11.9
Nonindustrial injuries.....	.7	.6	1.0	.9
Respiratory diseases.....	1.1	1.3	3.0	2.9
Digestive diseases.....	1.3	1.2	1.5	1.4
Nonrespiratory-nondigestive diseases.....	3.5	3.3	7.7	6.7
Number of days of disability per absence				
Sickness and nonindustrial injuries.....	43.9	43.7	37.9	39.4
Nonindustrial injuries.....	44.3	41.9	41.6	45.6
Respiratory diseases.....	26.0	25.5	23.1	23.4
Digestive diseases.....	47.8	47.5	40.7	44.1
Nonrespiratory-nondigestive diseases.....	54.5	58.3	48.6	53.5
Number of absences per 1,000 persons				
Sickness and nonindustrial injuries.....	149.9	146.7	347.0	302.2
Nonindustrial injuries.....	15.3	14.8	23.6	19.0
Respiratory diseases.....	43.9	49.8	127.7	125.8
Digestive diseases.....	26.3	25.0	36.9	32.8
Nonrespiratory-nondigestive diseases.....	64.4	57.1	158.8	124.6
Average number of persons <sup>2</sup> .....	55,506	55,853	13,480	12,831

<sup>1</sup> Industrial injuries and venereal diseases are not included. Ill-defined and unknown causes are included in the nonrespiratory-nondigestive diseases.

<sup>2</sup> These workers are members of 10 reporting organizations paying benefits for 26 or 52 weeks.

**Table 4. Absences per 1,000 male employees by cause (annual basis)—sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer—third and fourth quarters, 1952 <sup>1</sup>**

Cause <sup>2</sup>	Number of absences per 1,000 males beginning in specified period			
	Fourth quarter		Third quarter	
	1952	1951	1952	1951
<b>Sickness and nonindustrial injuries</b> .....	<b>123.1</b>	<b>125.0</b>	<b>103.8</b>	<b>109.3</b>
<b>Nonindustrial injuries (169-195)</b> .....	<b>14.8</b>	<b>16.1</b>	<b>17.4</b>	<b>17.3</b>
<b>Sickness</b> .....	<b>108.3</b>	<b>108.9</b>	<b>86.4</b>	<b>92.0</b>
<b>Respiratory diseases</b> .....	<b>33.4</b>	<b>33.7</b>	<b>18.2</b>	<b>21.8</b>
Tuberculosis of respiratory system (13).....	.6	.5	.5	.5
Influenza, grippe (33).....	8.0	8.7	3.8	5.1
Bronchitis, acute and chronic (106).....	6.1	6.6	2.6	3.7
Pneumonia, all forms (107-109).....	5.3	4.7	2.7	3.2
Diseases of pharynx and tonsils (115b, 115c).....	3.7	3.5	2.5	2.8
Other respiratory diseases (104, 105, 110-114).....	9.7	9.7	6.1	6.5
<b>Digestive diseases</b> .....	<b>23.6</b>	<b>22.2</b>	<b>20.1</b>	<b>22.6</b>
Diseases of stomach except cancer (117, 118).....	8.4	7.6	5.8	6.6
Diarrhea and enteritis (120).....	3.6	2.9	3.1	3.4
Appendicitis (121).....	4.1	3.9	3.5	4.8
Hernia (122a).....	2.8	3.7	3.3	3.1
Other digestive diseases (115a, 115d, 116, 122b-129).....	4.7	4.1	4.4	4.7
<b>Nonrespiratory-nondigestive diseases</b> .....	<b>48.5</b>	<b>49.9</b>	<b>45.7</b>	<b>44.3</b>
Infectious and parasitic diseases (1-12, 14-24, 26-29, 31, 32, 34-44) <sup>3</sup> .....	3.8	3.2	3.3	2.9
Rheumatism, acute and chronic (58, 59).....	3.3	3.6	3.0	3.0
Neurasthenia and the like (part of 84d).....	1.2	1.6	1.3	1.9
Neuralgia, neuritis, sciatica (87b).....	2.3	2.3	1.7	1.8
Other diseases of nervous system (80-85, 87, except part of 84d, and 87b).....	2.4	1.9	2.2	2.2
Diseases of heart and arteries, nephritis and high blood pressure (90-99, 102, 130-132).....	9.1	8.7	6.7	6.2
Other diseases of genitourinary system (133-138).....	4.9	5.2	5.1	4.3
Diseases of skin (151-153).....	3.6	3.5	4.2	4.3
Diseases of organs of movement except diseases of joints (156b).....	3.7	3.9	3.3	3.3
All other diseases (45-57, 60-79, 88, 89, 100, 101, 103, 154, 155, 156a, 157, 162).....	14.2	16.0	14.9	14.4
<b>Ill-defined and unknown causes (200)</b> .....	<b>2.8</b>	<b>3.1</b>	<b>2.4</b>	<b>3.3</b>
Average number of males.....	174, 594	173, 679	174, 353	174, 068

<sup>1</sup> Industrial injuries and venereal diseases are not included. <sup>2</sup> Numbers in parentheses are disease title numbers from International List of Causes of Death, 1939. <sup>3</sup> Exclusive of influenza and grippe, respiratory tuberculosis, and venereal diseases.



# Economic Benefits of Malaria Control

## In the Republic of Indonesia

By WARREN A. KETTERER, M.D., M.P.H.

**P**UBLIC HEALTH PROGRAMS beget long-range economic benefits which may appear obvious to public health workers but which are often overlooked in considerations of the economy of a nation. In the newly established Republic of Indonesia, such benefits, though difficult to determine precisely since sickness of all kinds is omnipresent and statistics are generally lacking, are becoming evident. The malaria control program, in operation by the Indonesian Ministry of Health with assistance from the Technical Cooperation Administration Mission (formerly the Economic Cooperation Administration Special Technical and Economic Mission) to Indonesia has provided data which are sufficiently reliable and significant to give some indication of its benefits to the economy of the country. These data, though as yet meager, also serve to emphasize the importance of public health endeavors in the underdeveloped countries of the world.

Indonesia, as well as having a high prevalence of tuberculosis, typhoid fever, yaws, leprosy, trachoma—in fact, most of the diseases known to man—is one of the world's most malarious areas. It has been estimated that malaria affects approximately 30 million of its 77 million people each year, causing more deaths than any

other disease and greatly limiting the productive capacity of the nation. The number of attacks of malaria infection each year undoubtedly outnumber the population. A spleen index of 80 percent has been found in many areas, and malaria epidemics have been known to kill one-fifth of the population of an area in a single year.

ECA assistance for the Indonesian Ministry of Health's malaria control program began in October 1950. By June 30, 1952, DDT-house-spraying operations had protected 999,000 persons in Java, Sumatra, Celebes, and Amboina from this disease. The malaria section of the Ministry directed \$400,000 in 1952 toward house-spraying activities and aimed at a population goal of nearly 2 million for the end of 1952. The World Health Organization has provided \$74,000 since 1950 for a malaria control demonstration area on the south coast of Java, and requested assistance from the United States foreign aid programs has totaled \$1,449,000, \$929,000 of this amount for DDT and the remainder for technical assistance, educational activities, and sprayers and other commodities needed for the program. The population goal of the spraying program for the end of 1953 is 5 million.

### Benefits to Agriculture

A concept of the broad economic importance of the malaria control program in Indonesia can be obtained from the realization that the activities are carried out in areas which are predominantly agricultural. Thus, malaria

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*Dr. Ketterer has recently returned to the United States after a 2-year assignment as deputy chief of the public health division of the Technical Cooperation Administration Mission to Indonesia.*

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control contributes to the production of rice, which has been called the hinge of Indonesian economy, and of such products as rubber, copra, tobacco, tea, and palm oil, which are among the country's leading exports. With Indonesia importing 600,000 tons of rice yearly, an increase in rice production is perhaps of even greater economic importance in this country than it is in countries which export rice, since it should permit a reduction in expensive importation and in the use of foreign exchange.

DDT-spraying operations have made possible the reclaiming of idle rice fields in some areas and, together with improved agronomic practices, have led to an increase in yearly yield in others. Before World War II, rice fields frequently had to be drained and left to dry for several weeks to eradicate mosquito breeding and to reduce malaria. The DDT-spraying program makes this procedure unnecessary, permitting year-round cultivation.

#### *Rice Production*

Along the Bay of Banten in northwest Java, more than 10,000 acres of once highly productive rice land lay idle and deserted for several years after the Japanese occupation. The actions of the Japanese had destroyed the pre-war malaria control drainage system; and, as the drainage ditches silted up and salt water from the bay entered the rice fields, *Anopheles sundaicus* multiplied unchecked. The farmers remaining in the area, in their new concept of freedom, did not repair and maintain the permanent drainage system, but attempted to produce rice without regard for the threat of malaria. Malaria epidemics after 1944 affected more than 80 percent of the people, and the farmers were forced to abandon their land. The area soon reverted to tropical wilderness.

In September 1951, two DDT-house-spraying teams were sent into the area by the Indonesian Ministry of Health. As soon as the inhabitants nearby learned of the malaria control work, they began reclaiming the idle land. When the people came into the area, they found that malaria no longer decimated their population as it had done before the spraying.

By March 1952, 2,090 acres of this land were again under cultivation by old inhabitants, and 383 additional acres by new settlers (1). By

the fall of 1952, almost all of the area was under cultivation, and more farmers and their families were returning every day. When all 10,000 acres are again producing rice, it is expected that the yearly yield will be some 4,400 tons of husked rice to augment Indonesia's food supply. The total value of this rice should be approximately 8,380,000 rupiah (\$740,000); the total cost of the initial spraying operation was approximately 140,000 rupiah (\$12,000), less than 2 percent of the value of the yearly yield.

In addition to this program, the Ministry of Health plans to set up a yearly DDT barrier in this area between the coast and the inland. This should make possible the reclamation of another 18,000 acres of malaria-depopulated farmland because this DDT barrier will safeguard the inland area from mosquito-breeding places along the bay.

#### *Export Products*

A group of estates producing chiefly palm oil, but also other products, on the east coast of Sumatra were sprayed in 1950, protecting a population of 15,000. Evidence is available that malaria, which affected more than 80 percent of the population before the spraying activities, has been greatly reduced. Before spraying, examination of 402 babies revealed a parasite rate of 22 percent; the parasite rate in 298 infants born after the completion of spraying was 0 percent. The parasite rate in school children also declined, from 23 percent before spraying to 4 percent after.

Of great significance to the economy of the estates was the considerable decrease in admissions to the estate hospital after completion of the initial spraying. In the 11 months before spraying operations were begun, 2,363 patients were admitted, 700 of them with malaria. In the 11 months following spraying, 1,346 patients were admitted, 90 with malaria (1). The simultaneous decrease in illnesses aggravated by malaria, as reflected by the decrease in admissions excluding those for malaria, is characteristic. The decrease in hospital expenses alone was enough to finance the malaria control operations in this area. In addition, estate managers report a two-thirds decrease in absenteeism among the workers, resulting in an



increase in the number of working days and in production per man (1).

### Transmigration Projects

Thirty years ago the Government of the Netherlands East Indies attempted a significant transmigration project in south Sumatra in an effort to relieve the population density in Java and to open new rice-producing areas. Malaria hindered the success of the project and curtailed the achievements planned for the area. Only with intensive use of expensive quinine could malaria mortality be maintained at a tolerable level. Late in 1951, DDT-spraying was commenced in the town of Metro, and by the end of 1952, 80,000 persons were protected from malaria. Continuation of the program will protect an additional 250,000 persons in this area (1). Already the transmigration area is becoming prosperous. Malaria rates are declining, additional land is being cleared, and new rice fields are opening up.

Another highly malarious transmigration area in North Celebes—around Dumoga—was sprayed in 1952. Before the war, transmigration attempts failed in six areas of Celebes because of malaria.

### Other Benefits

Continued malaria control activities are also protecting the people in the major cities of Indonesia, among them Djakarta and Surabaya. In 1952, the hospitals of Djakarta reported a three-fifths reduction in admissions for malaria over the previous year.

In the coastal area around Djakarta, malaria control measures are benefiting the fishing industry. In the village of Marunda, 3 miles east of Tandjungpriok, *Plasmodium falciparum* infection has nearly disappeared. In 1949, the spleen index for children in this town was 91.5 percent and for adults 83.6 percent; malaria infection was totally absent in children born during the year after the spraying. In the village of Tjilintjing, 2 miles from Marunda, which was not sprayed, not only did the spleen index remain unchanged but a severe epidemic of malaria occurred (1).

On the prison island of Nusa Kambangan off

the south coast of Java, the habitations of its 9,680 persons were sprayed in mid-1952. Malaria was so serious on this island that the yearly cost of quinine for treatment was four times the cost of the malaria prevention operations.

In the area of Painan, Sumatra, which at one time had a spleen index of over 80 percent, 150,000 persons have been protected against malaria. Three months after spraying was begun in June 1952, the number of mosquitoes in the town itself had been so reduced that mosquito nets were no longer necessary.

In the fertile, but security-poor, area around Tjiandjur in central Java, the malaria control program has protected 190,000 persons. Ten months after spraying in an experimental area, the infant parasite rate was 0 percent; in a control (nonsprayed) area nearby, the rate was 18 percent (1). In their appeal for protection from malaria, local inhabitants guaranteed the safety of spraying crews in insecure areas.

Spraying of Tjilatjap, the only seaport on the south coast of Java, was begun in April 1952 and completed in June 1952, protecting 56,884 persons from malaria (1).

### Summary

There is evidence that the malaria control program in Indonesia, which had protected nearly 1 million persons by the end of June 1952, is producing beneficial effects on several phases of the country's economy. Particularly important among these are the production of rice and such export products as rubber and palm oil, the establishment of transmigration projects, and the sea and inland fishing industry. In areas where DDT-house-spraying activities have been carried out, once-idle rice fields have been brought back under cultivation and new rice fields opened up; the number of hospital admissions for malaria, as well as the total number, have declined; and absenteeism among estate workers has decreased.

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# Glaucoma Case Finding in Philadelphia

By EMILY K. HANKLA

**A**T LEAST ONE-EIGHTH of the blindness in the United States is caused by glaucoma, according to some estimates (1), and with the aging of the population it is probable that this condition will increase in importance. Although there is general agreement among ophthalmologists that the most important factor in the management of chronic simple glaucoma is its early detection, only one mass case-finding campaign has been reported in detail, that of the Philadelphia Committee for the Prevention of Blindness.

From 1944 through 1950, the period covered by this report, a total of 10,000 persons was screened, the majority during the fiscal year 1950, when the Public Health Service supported the committee's work. Earlier papers by the executive director of the committee and by ophthalmologists who took part in the case-finding procedure have described the background, methods used, and results of the Philadelphia program (2, 3). This paper presents a detailed description of the population screened, the initial tonometer readings, and the case-finding yield at various tonometer readings above the screening level.

## Screening and Retesting Examinations

The screening examination, which was performed by certified ophthalmologists, included

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*Miss Hankla is a statistician in the program analysis section, Division of Chronic Disease and Tuberculosis, Public Health Service. This case-finding program was conducted by the Philadelphia Committee for the Prevention of Blindness.*

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external examination for gross pathology, ophthalmoscopic examination of the fundus, visual acuity tests, and intraocular tension readings, using calibrated Schiøtz tonometers and a modification of the Schiøtz conversion chart (4). After these procedures ran smoothly, people were examined at the rate of 20 per hour. The screening tests were conducted in the plants where the screenees worked.

As has been found desirable in other mass case-finding programs, persons with positive screening results were retested before being referred to private physicians. Criteria for retesting were, in general, suspicious clinical findings or tonometer readings of 25 mm. Hg or more. The glaucoma screenee who returned for recheck might be classified as negative after a second or third tonometer reading; or before the examining physician decided upon a negative diagnosis or referral to a private physician, the screenee might have his fields of vision charted or a water provocative test or gonioscopic examination performed.

The retest clinic provided an additional service. Persons with borderline symptoms—persistent or intermittent tonometer readings of 28 to 30 mm. Hg and/or a rise of 6 to 8 mm. Hg on the Marx water-drinking test—were followed until a diagnosis of glaucoma could be established or ruled out. There were 71 such cases when they were classified in 1951 (3). In addition, there were 100 "observation" cases, persons with no indication of glaucoma except slightly to moderately elevated intraocular tension, a difference of 4 mm. or more in tension readings between eyes, or a family

**Table 1. Number and percentage of employed persons screened for glaucoma, by sex and age groups, in relation to the total population of Philadelphia<sup>1</sup>**

Age group	Total population		Number of persons employed		Persons screened <sup>2</sup>			
					Number		Percent of employed	
	Male	Female	Male	Female	Male	Female	Male	Female
All ages, 35 years and over-----	463, 300	516, 200	358, 900	153, 000	6, 496	3, 457	1. 81	2. 26
35-44 years-----	145, 900	173, 700	127, 400	64, 500	1, 830	1, 176	1. 44	1. 82
45-64 years-----	239, 900	248, 000	198, 200	80, 300	4, 399	2, 173	2. 22	2. 71
65 years and over-----	77, 500	94, 500	33, 300	8, 200	267	108	. 80	1. 32

<sup>1</sup> Bureau of the Census: 1950 Census of Population Preliminary Reports, Series PC-5, No. 36, Aug. 29, 1951.

<sup>2</sup> 47 screenees under age 35 omitted from this table.

history of glaucoma. These were kept under observation until they had remained symptom-free for several years or had developed additional symptoms.

Some persons with very high tonometric readings and suspicious clinical findings were referred immediately to private ophthalmologists or to clinics. Diagnoses were obtained for these patients. Very few who were advised to have a tonometric recheck or further examination refused. Only 19 persons were lost from the study.

#### Persons Screened

The group screened, although numbering fully 10,000 persons, is admittedly not a representative sample of the population of Philadelphia. For example, those not employed on account of age, sex, poor vision, or other reasons were not represented since the program covered only employees of firms who cooperated in the study. Included among the 10,000 were 215 department-store shoppers who were screened as a demonstration. The other 9,785 persons were known to be working in factories, stores, or Government installations when they were first tested (table 1).

The screenees were predominantly white (90 percent), as is the population of Philadelphia (87 percent white). Fifty-seven and one-half percent were white males and 32.3 percent were white females. There were about three times as many nonwhite males as nonwhite females.

On the other hand, comparison of the number of screenees with the number of Philadelphia residents of each sex employed in April 1950 indicates that a slightly higher percentage of female (2.3) than of male (1.8) employees were included among those screened for glaucoma. The relatively greater coverage of female workers was true of each of the broad age categories and was pronounced among employees 65 years of age or older.

Attempting to reach the group most likely to have glaucoma, the committee concentrated on people over 35 and discouraged younger persons from entering the screening line. People are less likely to be employed after they reach 65 and, of the individuals within that age bracket employed in Philadelphia, relatively fewer were included among the screenees. Therefore, most of the screenees were between 35 and 65 years of age.

#### Intraocular Tension Readings

Tonometer readings for both eyes were reported for 9,645 persons. The distribution of initial tonometer readings in the eye with highest tension, expressed in millimeters of mercury, is illustrated in figure 1. Since no attempt was made to smooth out irregularities, a tendency for certain readings to appear more often than adjacent ones is apparent. This is a familiar phenomenon to anyone acquainted with other measurements which result from translating,



according to a calibration chart, the positions of a wavering pointer on a small scale.

To illustrate, more than one-fifth (22 percent) of the group tested had initial tensions of 22 mm. Hg, the modal, median, and mean reading for the eye with the highest tension. On both sides of this peak, there were fewer readings than would be expected in a normal distribution. For only 322 persons was the initial high tension given as 21 mm. Hg. On the right-hand side of the mode, the slope is more regular but there are only 3 millimeters between the modal value and 25 mm. Hg, which was adopted as the screening level. The wide and one-sided range at the base, from 11 to 65 mm. Hg, with a few high values representing the more abnormal or unusual occurrences, is also characteristic of measurements of blood pressure, blood sugar, or hemoglobin.

Of the 9,645 persons with tonometer readings for both eyes, 1,056 (11 percent) had intraocular tensions in one or both eyes equivalent to 25 mm. Hg or more, the screening level which had been adopted. Of these, 815 were called back for reexamination or put under medical care. Glaucoma or "borderline" intraocular tension was diagnosed in 21.2 percent of the 1,056 suspects with initial tensions of 25 mm. Hg or more, or 2.2 percent of the total number screened. Virtually none of the glaucoma patients had any previous knowledge of their disease.

In figure 2, tension readings above the screening level of 25 mm. Hg have been grouped in 3 mm. intervals. Even in the first interval, among those with initial readings of 25 through 27 who were retested, 10 percent (32 cases) were classified as having glaucoma or "borderline" tensions. With higher initial readings, the percentage of positive classifications increased. Original tonometer readings of 40 mm. Hg Schiøtz or higher were followed in all instances by diagnoses of glaucoma.

It should be noted, though, that the cases picked up at the 40 mm. Hg Schiøtz screening level numbered only 20, compared with 32 instances of glaucoma or "borderline" intraocular tension with initial readings of 25 to 27 mm. Hg and 90 at the 28 to 30 mm. Hg level. Moreover, all but one case with initial tensions of 40 mm. Hg or more were later classified as advanced

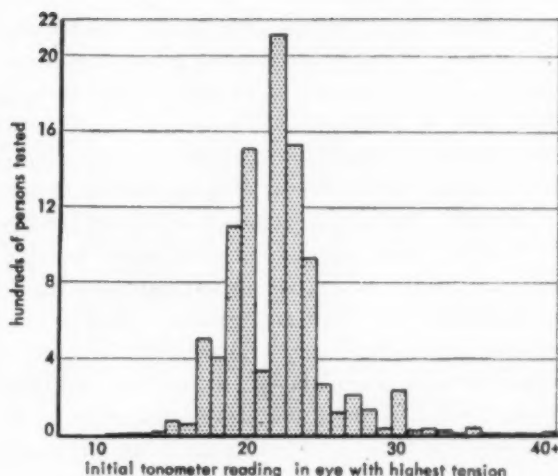


Figure 1. Number of persons tested, by initial tonometer reading (in mm. Hg Schiøtz).

glaucoma, while 95 cases (78 percent) with original tensions of 25 to 30 mm. Hg were either early glaucoma or "borderline" intraocular tension. (See figure 3.)

#### Age and Intraocular Tension

With age there is an increase in the percentage diagnosed as having glaucoma or "borderline" intraocular tension, as may readily be seen in table 2.

If all cases are grouped together, and distributed by their age, their ratio to the total num-

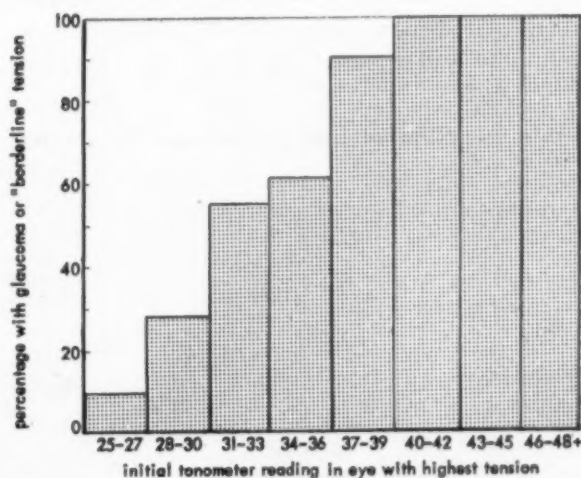


Figure 2. Percentage of persons with confirmed glaucoma or "borderline" intraocular tension who had initial tonometer readings (in mm. Hg (Schiøtz) of 25 or more.



ber of persons screened rises until age 65 and then levels off. For advanced glaucoma, however, this ratio continues to rise rather steeply after age 65 (fig. 4). Early glaucoma and "borderline" intraocular tension were found only slightly more frequently in the older age categories, and the percentage drops after age 65. On the other hand, relatively more "borderline" and early cases than advanced were found in the 35 to 44 year age group. Among the persons with glaucoma who were 55 or over, a larger number were classified as advanced than as early or "borderline," and among those 65 or over, 64 percent had glaucoma in an advanced stage.

Since the program was specifically designed for persons 35 and over, no data are available to show the possible results of screening persons under 35. Within age groups, statistical tests show no significant difference by race or sex.

#### Fundus Examination

By careful fundus examinations in the Philadelphia screening, ophthalmologists discovered one patient with initial tension readings of 15 and 17 mm. Hg who was later diagnosed as having glaucoma. All other "suspicious fundus" cases eventually diagnosed as glaucoma had initial tensions of 25 mm. Hg or more.

However, mass screening is not directed toward "low tension" glaucoma, called by some authorities pseudoglaucoma (5). There is considerable evidence that this is not primary glau-

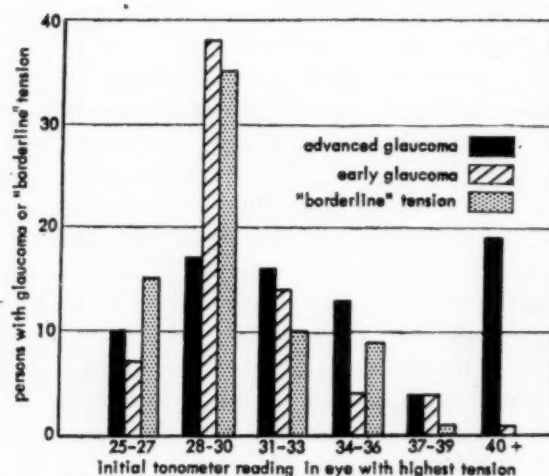


Figure 3. Number of persons with glaucoma or "borderline" intraocular tension, by initial tonometer reading (in mm. Hg Schiøtz) and by stage of glaucomatous findings.

coma at all; if and when it is, the manifestations are different. The number of cases of "low tension" glaucoma is relatively unimportant compared with chronic simple glaucoma, for which a higher than average tension is the earliest symptom (6, 7).

Nor is mass screening directed toward types of glaucoma which may be detected during acute attacks.

#### Readings for Right and Left Eyes

Consistently, in almost every sex and age group, the eye more frequently having the greatest tension was the left. However, distri-

Table 2. Number and percentage of screenees by age groups classified as having glaucoma or "borderline" intraocular tension

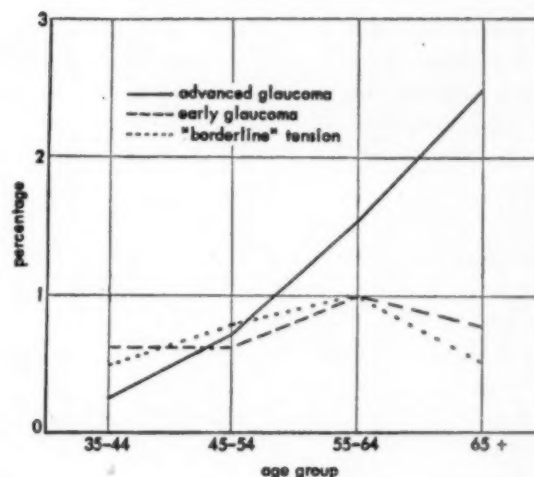
Age group	Persons screened	Persons classified as having glaucoma or "borderline" intraocular tension		Persons diagnosed as having glaucoma, by type				"Borderline" intraocular tension	
				Advanced		Early			
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
All ages, 35 years and over-----	10, 000	224	2. 2	84	0. 8	69	0. 7	71	0. 7
Under 35 years-----	47	0	-----	0	-----	0	-----	0	-----
35-44 years-----	3, 006	35	1. 2	7	. 2	17	. 6	11	. 4
45-54 years-----	4, 183	90	2. 2	31	. 7	25	. 6	34	. 8
55-64 years-----	2, 389	85	3. 6	37	1. 5	24	1. 0	24	1. 0
65 years and over-----	375	14	3. 7	9	2. 4	3	. 8	2	. 5

butions of tensions for the two eyes are similar, although more left eyes have higher readings near the modal value. Whether this results from an inherent biological phenomenon or from the specific mechanics of the testing situations is not known.

As compared with criteria based on the height of intraocular tension readings, the difference between the tension readings in the two eyes proved to be of no value in case finding. (See table 3.) One glaucoma case without elevated tension on the screening test may have been suspected on the basis of a 5 mm. Hg difference between the readings for the right and left eyes. On the other hand, for more than a third (36.2 percent) of the glaucoma or "borderline" patients who had tension readings for both eyes, no difference was found. Almost two-thirds (64.3 percent) had readings within 3 mm. Hg of each other for the two eyes—a difference which some investigators have stated to be within the margin of error (3, 8). Judg-

**Table 3. Number of persons examined and number and percentage classified as having glaucoma or "borderline" intraocular tension, by tonometer reading in eye with highest tension and by difference in tension between eyes**

Tonometer reading (mm. Hg) in eye with highest tension	Difference in tension between eyes (mm. Hg)	Number of persons examined	Persons classified as having glaucoma or "borderline" intraocular tension	
			Number	Percent
Less than 25	All	8,567	4	0
	00-01	6,662	2	.0
	02-03	1,692	1	.1
	04-05	171	1	.6
	06+	42	0	-----
25+	All	968	217	22.4
	00-01	410	91	22.2
	02-03	305	48	15.7
	04-05	133	30	22.6
	06+	120	48	40.0
Total with known tension and classification		9,535	221	2.3
Unknown tension in one or both eyes or not classified		465	3	-----
Total		10,000	224	-----



**Figure 4. Percentage of persons diagnosed as having glaucoma or "borderline" intraocular tension, by age group and stage of disease.**

ing from the data available, suspicion aroused by high intraocular tension may well be strengthened if there is a difference of 4 mm. Hg or more between eyes, but the latter alone cannot be considered as a case-finding device.

#### Discussion

How many glaucoma cases might have been found by rechecking persons whose eyes had initial tension readings of 24 mm. Hg? Retests were made on some screenees (an unknown number) who had initial tensions of 24 mm. Hg in both eyes, and two of these persons had glaucoma—advanced in one case. Undoubtedly, rechecking all eyes which had 24 mm. Hg tensions would have increased the effectiveness of the case-finding program, but at considerable cost. There were 884 persons with initial readings of 24 mm. Hg in the eye with highest tension, compared to a total of 1,056 with tensions of 25 mm. Hg or higher. Thus, lowering the screening level one point would have almost doubled the group subject to recheck, which would have been impractical for a case-finding project operating on a very limited budget.

There is a need for a specially designed project in which every one of a representative group of adults, including those with negative findings, would have repeated tonometer tests, provocative tests, visual fields charted, gonioscopic

examination, and diagnosis. For those with "borderline" tonometer readings and negative diagnoses, the tests should be repeated at intervals. Investigation is needed before we can estimate how elevated tension must be to be regarded as dangerous. Such a study would furnish a basis for estimating the number of those who might be inaccurately classified as negative in a mass screening survey. These data would enable us to compare "borderline" screening levels for sensitivity as well as specificity.

Further investigation of screening methods is fundamental to a public health approach to this problem. Although without some count of the "false negatives," we cannot accurately estimate the size and cost of the problem of undiscovered glaucoma, we know that it is large and expensive. The cost of services to the blind paid from taxes or privately donated funds has been estimated to be in excess of \$125,000,000 per year (1,9). This sum does not include expenditures by relatives or by blind persons themselves. Nor does it include the costs of unemployment caused by blindness or any of the economic costs of partial vision.

### Summary

Among 10,000 working people screened for chronic simple glaucoma by the Philadelphia Committee for the Prevention of Blindness, no differences in frequency were found by race and sex, within age groups. More cases of chronic simple glaucoma are found in the older age

groups; these cases are likely to be advanced.

The higher the intraocular tension, as indicated by a Schiøtz tonometer reading, the more specific is the indication of glaucoma, especially of advanced glaucoma. On the other hand, the "borderline" tension levels are most productive of "borderline" cases.

The need for more study, with emphasis on long-term followup of "borderline" cases, is evident from the data.

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## Departmental Council Formed To Aid Secretary

To achieve maximum coordination in the administration of the Department of Health, Education, and Welfare, the Secretary has created a Departmental Council composed of top officials and heads of constituent units of the Department. Henry G. Haskell, Jr., of Wilmington, Del., has been named as secretary of the Council.

# Disinfecting Garbage in Truck Bodies By Direct Steam Injection

By HERBERT A. BEVIS, B.C.E., M.S.E., FRANK TETZLAFF, C.E., M.C.E.,  
and FLOYD B. TAYLOR, B.S.S.E., M.P.H.

**F**EEDING of raw garbage has been shown to be the primary mode of transmission of trichinosis in swine (1) and thus is indirectly the source of human infection. It is felt that this practice contributes greatly toward the dissemination and perpetuation of other swine diseases.

The escape of vesicular exanthema, a highly contagious swine disease, from its two-decade isolation in the swine herds of California and its subsequent wildfire spread through the herds of the Nation have further motivated a critical review of the practice of feeding garbage to swine. The exact path the disease followed from the time it escaped from California until it was detected among swine at a hog cholera serum plant in Nebraska was investigated by the United States Department of Agriculture and various State agencies concerned. Indications were that garbage containing infected pork scraps had been fed raw to swine at a farm in Wyoming and that infected animals had been shipped to other areas of the country be-

fore the disease was recognized. As of May 1953, 468 of 493 herds in which the disease had appeared had been fed raw garbage, and outbreaks had occurred in 41 States (2).

The work of Wright and Bozicevich (3) showed that the worm *Trichinella spiralis*, the infectious agent in trichinosis, could be destroyed or made nonviable by subjecting pork scraps containing the organism to adequate heat. The degree of heat that constitutes adequate treatment will depend upon the thickness of the pork scraps and the duration of heat. Experiments have shown that the actual temperature required throughout the mass to destroy *Trichinella spiralis* is 131° F. (4) and a temperature of 145° F. maintained for 30 minutes is thought to render the virus of vesicular exanthema nonviable (5). However, the work of Wright and Bozicevich (3) led to the conclusion that for practical purposes disinfection of the garbage by boiling for 30 minutes was desirable and that this degree of heat treatment is sufficient to "effect the destruction of trichina larvae in pieces of pork up to 3 inches in thickness and probably in pieces of pork of greater thickness provided the garbage is allowed to cook gradually." This statement is the basis for general recommendation that all garbage be boiled for at least 30 minutes prior to feeding to swine unless some other manner of disinfection is approved by health or agricultural authorities concerned as being equally effective.

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*Mr. Bevis is sanitary engineering consultant to the National Park Service for Public Health Service, Region III; Mr. Tetzlaff is regional engineer in the Region II office; and Mr. Taylor, a sanitary engineer formerly with Region II, is now assigned to the Clinical Center, National Institutes of Health.*

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The application of this heat treatment principle on a nationwide basis in England and Canada tends to substantiate the experimental work. In these two countries, where garbage is cooked prior to swine feeding, most swine diseases have practically disappeared and the incidence of trichinosis in humans is estimated to be only about 1 case in 75 persons (6). In the United States, where raw garbage is used as swine feed, the incidence of trichinosis in humans is estimated to be 1 case in 6 persons (7). More accurate figures on the prevalence of this disease are not available due to its many manifestations and the absence of a specific diagnostic confirmation other than recovery of the organism by biopsy.

If garbage, a valuable waste product of the American home, is to continue to be reclaimed in the form of pork, some economical method of disinfecting it must be found.

At the present time the general feeling among the swine farmers of the country is that an installation which could provide the necessary heat treatment of garbage in the truck in which it was collected would be most practical. This procedure would eliminate the necessity of re-handling the waste and would thus be a saving in time and labor. In order to ascertain if such treatment in truck bodies could produce satisfactory temperatures, the Region II office of the Public Health Service conducted an experiment at the North Bergen Stock Farm, North Bergen, N. J., during February, March, and April 1953 on the heat treatment of garbage in truck bodies, using direct steam injection as the source of heat and agitation.

### Equipment

The truck used in this experiment was equipped with a rectangular metal tank body 15 feet long, 8 feet wide, and 34 inches deep. The tank was covered with semicylindrical sliding doors and had two arched wheel wells over the rear wheels of the truck.

A 2-inch steam supply line entered the tank high on the left side of the front, ran across to the middle of the front, and down to the bottom, where it was connected to a 1½-inch header. From the header, 1-inch laterals, numbering from four to seven during the course of

the experiment, were run the length of the tank to distribute the heat. One-eighth inch holes were drilled on a horizontal plane through both walls of each lateral, on 12-inch centers in the forward half of the tank and on 6-inch centers in the rear half. Where necessary, the laterals were curved over the two arched wheel wells and welded in place.

A 2-inch flexible rubber hose fastened to a universal coupling by a heavy-duty hose connection was used to connect the steam manifold system in the truck to a 150-hp, oil-fired, horizontal boiler. This boiler was capable of providing steam at a pressure of 125 psi, but in this series of tests the automatic control was set to maintain a pressure between 45 and 55 psi. As these tests were being run the boiler was concurrently providing heat for the animal barns.

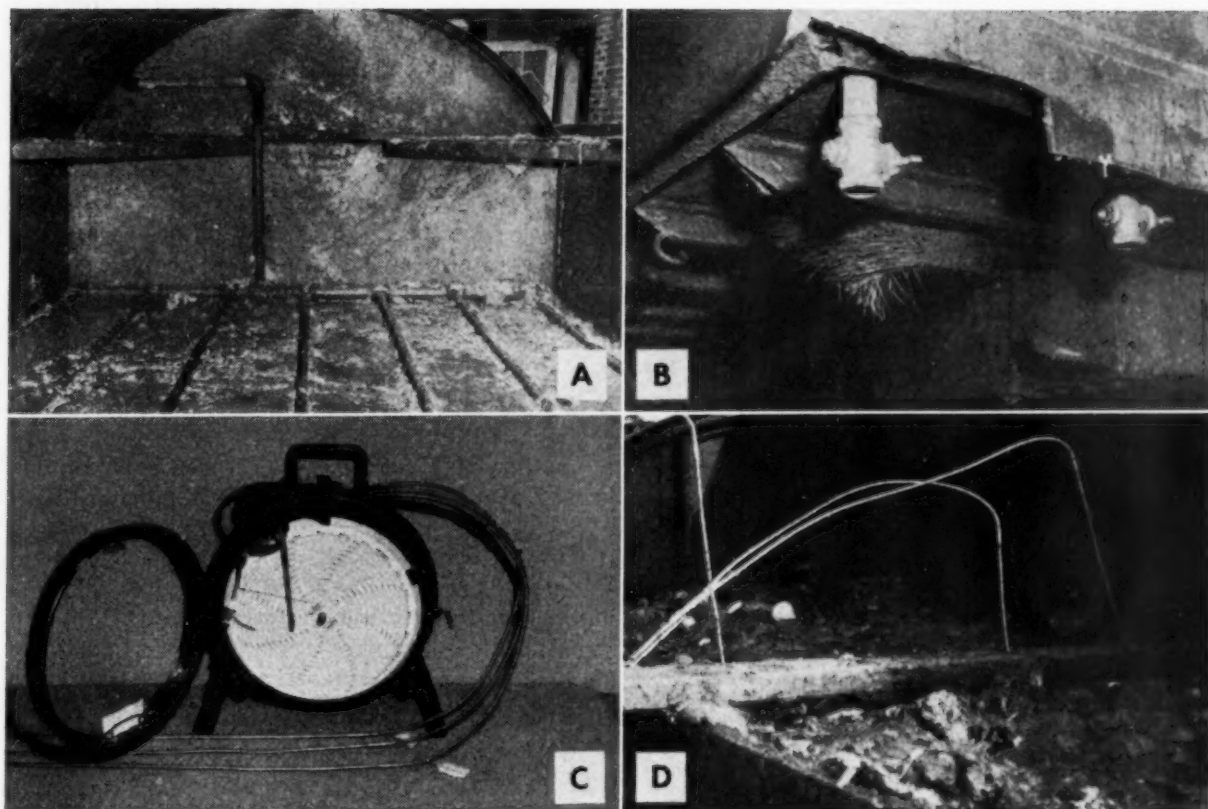
A specially designed, portable, three-pen recording thermometer was used to record temperatures at various points in the garbage mass during each cooking cycle. This instrument had a class IV thermal system (liquid expansion), 0°–300° F. temperature range, a mechanically driven clock on a 24-hour cycle, and three 14-foot acid-resistant leads (10 feet flexible and 4 feet rigid stainless steel).

A wooden beam was used to support the thermometer leads in the garbage mass during each test, with the thermometer bulb located at the end of each lead. The locations of the leads were varied during the tests, as shown in the table.

### Procedure

Prior to each test in this experiment, the garbage, which had been collected from the hotels and restaurants of New York City during the preceding night, was leveled in the tank with a garden rake. Often this garbage was of such a solid nature that a man experienced no difficulty in walking on top of it as it was prepared for treatment. Three to six inches of clearance was normally allowed between the surface of the waste and the rim of the tank to accommodate the accumulation of steam condensate. Under these conditions the tank held about 300 cubic feet (2,244 gal.) of waste, which weighed from 8 to 10 tons.

After the garbage had been leveled, the ther-



(A) Interior of truck, showing seven distribution laterals. (B) Ground key blowoff valves for laterals, located under rear of truck. (C) Portable recording thermometer with 3 bulbs and 3 indicating pens. (D) Thermometer bulbs placed in garbage and held secure by wooden support.

mometer support was placed across the tank above the section of the truck body to be investigated during the test. The three thermometer bulbs were inserted into the garbage through holes in the timber to the desired depth and were locked in place with set screws. By varying the location of the thermometer bulbs longitudinally, laterally, and vertically, temperatures in all sections of the tank were investigated during the course of the experiment.

The steam was turned on after the initial temperature of the garbage mass had been determined. Erratic heat distribution in the first tests quickly established the need for a means of eliminating condensate and garbage liquor, which tended to clog the lines, and blowoff valves were installed. During the tests made after the valves were installed, the laterals were drained as soon as pressure was applied to the system, and any condensate or garbage liquor in the lines was removed. This draining opera-

tion was repeated several times during each test.

When the desired temperature had been reached and maintained for the required length of time the steam was turned off and the garbage was allowed to cool. The thermometer bulbs remained in the mass during the first part of this cooling period in order to ascertain the cooling characteristics of each section of the tank. The center portions of the garbage cooled very slowly and it was normally the following day before it was unloaded and fed to swine.

Since the tests were conducted out of doors the atmospheric temperature was noted during each run.

### Results

In the first series of tests in this experiment a steam distribution system was used. The system contained 4 laterals connected to the main

header across the front of the tank, and spaced on 30-inch centers. The 2 outside laterals were elbowed and extended about 3 feet across the rear of the tank. When steam was introduced into the garbage mass through this system, a liquid channel soon formed directly above each lateral and most of the steam took this path of least resistance to escape. This flow of steam caused a mound of waste to be thrown up between the laterals which heat did not penetrate. Upon one occasion, after 4 hours of heating, including 3 hours of boiling in the watery channels, a temperature of 98° F. was found in 1 of these mounds.

In an effort to overcome this channeling tendency, 2 additional laterals were added, making a total of 6 laterals on 16-inch centers.

The elbowed extensions of the two outside laterals across the rear of the tank had been found to be ineffective, and were omitted. This new design reduced the channeling tendency, but a critical condition was located directly behind the wheel wells on each side of the tank. Either condensate or garbage liquor appeared to be filling the pipe lines at a point immediately after they curved over the wheel wells, and very little steam reached the garbage in these two areas. The design did produce acceptable results on occasions but generally the results were erratic and uncertain.

To eliminate channeling completely, the number of laterals was increased to 7, on 14-inch centers, and to remove condensate and garbage liquor from the lines, each lateral was

Temperature-time results with improved steam distribution design

Run No.	Date of test and air temperature during test	Heating time (minutes)	Pen No. <sup>1</sup>	Location <sup>2</sup>			Temperature variation and time each temperature maintained (min.)		
				x	y	z	Above 170° F.	Above 190° F.	Above 210° F.
6	Mar. 12 41°-43°	105	1	Bottom-----	<i>Feet</i> 3.5	12	230	140	65
			2	Bottom-----	2.5	12	130	60	(206° F. max.)
			3	Bottom-----	.5	12	115	85	25
7	Mar. 18 41°-40°	80	1	Bottom-----	3.5	13	130	95	70
			2	Mid-pt-----	2.5	13	360+	360+	75
			3	Mid-pt-----	.5	13	195	200	65
8	Mar. 20 42°-43°	105	1	Near surf-----	3.5	13	130+	70	(199° F. max.)
			2	Near surf-----	2.5	13	160+	125	95
			3	Bottom-----	.5	13	105+	85	45
9	Mar. 25 49°-50°	98	1	Mid-pt-----	4.5	8	95+	90+	60
			2	Near surf-----	2.5	8	45+	30+	5
			3	Bottom-----	.5	8	95	50	(195° F. max.)
10	Mar. 27 40°-41°	110	1	Mid-pt-----	4.5	3	165	10	(191° F. max.)
			2	Mid-pt-----	2.5	3	345+	345	(209° F. max.)
			3	Bottom-----	.5	3.4	220	145	90
11	Mar. 30 43°-44°	65	1	Near surf-----	3.4	3.4	210	85	10
			2	Bottom-----	1.8	1.8	110	70	40
			3	Mid-pt-----	.5	.5	55	15	(198° F. max.)
12	Apr. 1 48°-49°	135	1	Near surf-----	4.2	2.2	310+	35	(200° F. max.)
			2	Mid-pt-----	6.0	3.2	310+	300	270+
			3	Mid-pt-----	7.7	4.2	280+	20	(193° F. max.)
13	Apr. 3 46°-49°	90	1	On surf-----	4.5	10.6	80	30	5
			2	Bottom-----	6.2	11.6	75	(180° F. max.)	(180° F. max.)
			3	Mid-pt-----	7.9	12.6	240+	240+	60

<sup>1</sup> No. 1 pen, red; No. 2 pen, violet; No. 3 pen, green.

<sup>2</sup> Location of thermometer bulb is indicated by x, y, and z axes. The bottom left front corner of the truck body serves as the origin, x being the vertical axis, y the transverse axis across the truck from left to right, and z the longitudinal axis from front of truck to rear.



elbowed down through the rear of the tank bottom and terminated with a 1-inch ground key blow-off valve. A watertight, bolted, and removable tail gate necessitated placing the valves under the tank rather than on the rear wall. This improved design gave a uniform distribution of steam and normally produced acceptable heat treatment. A tabulation of the results of eight runs using this improved design is given in the table.

Several times during the course of the experiment "dead spots" were located in the garbage mass which heat did not penetrate. These spots were usually in a tightly packed wad of material held together by napkins or papers.

After a uniform distribution of steam was obtained, heat was found to rise to the surface of the mass in a distinct horizontal blanket except around the perimeter of the tank, where steam followed the metal sides to the surface very quickly.

#### Conclusions and Comments

1. Garbage can be disinfected in a metal tank truck body using steam injected directly into the mass through laterals placed on 14-inch centers and terminated with blowoff valves. (There were seven laterals in the truck body used in the experiment.) Due to the many possible sources of error in this type of system, however, steam injection in truck bodies is not the ultimate solution to the problem, either from the viewpoint of the operator or of the regulatory agency, and this system of treating garbage with heat should be used only as an interim measure until a properly designed built-in-place installation is available.

As a result of an analysis of general steampipe layout design procedures, made after completion of the heat treatment experiment, the following theoretical conclusions seemed indicated:

(a) The cross-sectional areas of the header pipe should be approximately equal to or slightly larger than the cross-sectional area of the supply line.

(b) The total cross-sectional area of the laterals should be approximately equal to the cross-sectional area of the header pipe.

(c) The aggregate area of the drilled holes should be approximately one-half that of the steam supply line. In general, the smaller the aggregate area of the holes, the more uniform the steam flow will be out of each hole, and smaller holes will allow the use of a greater number of holes, thus insuring more even heat distribution through the garbage.

These theoretical conclusions may be checked in future experiments.

2. Separation of edible and nonedible waste material is very desirable. However, if any glass bottles should accidentally be included in the garbage they will not be broken by this type of heat treatment.

3. Breaking up any semisolid masses of material as the garbage is placed in the tank will help reduce the possibility of "dead spots" and inadequate heat penetration.

4. Manual agitation of the garbage with a wooden paddle will help insure proper distribution of heat.

5. Three to six inches should be allowed between the surface of the garbage and the top of the tank to prevent spillage when steam condensate accumulates.

6. The surface of the garbage should be covered to conserve heat and prevent spattering. If possible, the treatment should be provided in an insulated building, especially during the winter.

7. Laterals should be blown off as soon as steam pressure is applied and at half-hour intervals thereafter.

8. The equipment should be cleaned after each use. Special care should be given to the interior of steam lines and orifices because cooked garbage is sucked into the lines by the vacuum formed when the steam pressure is turned off. This cooked garbage will solidify as it cools and may block the line.

9. Uniform spacing of orifices on 6-inch centers over the entire length of the laterals would probably produce results as good as, if not better than, the results obtained with this equipment.

10. When the cooked garbage is allowed to cool in the tank it usually requires up to 24 hours for it to cool sufficiently to be fed to swine. This means the truck in which garbage is treated would be out of service every other



day and twice the original number of trucks would be required. If the cooked garbage was unloaded and spread in thin layers it would cool much faster and the truck would be free for operation.

11. The swine farmer who cooperated in this experiment reports that cooking made less desirable particles of garbage, such as citrus rinds and potatoes, more attractive to the pigs, resulting in a much smaller amount of waste.

12. The adequacy of heat treatment can be determined only through an investigation of the entire mass of garbage after the installation of the equipment.

#### ACKNOWLEDGMENTS

Acknowledgment is made of the cooperation of Charles Miller & Co. and the North Bergen Stock Farm of North Bergen, N. J. Acknowledgment is also made of the information proffered by Arthur C. Stucki, special assistant for mechanical engineering, National Institutes of Health, Public Health Service.

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## Children's Bureau Studies Childhood Accidents

Accidents kill and cripple more children in the United States than all infectious diseases of childhood combined, according to a report on childhood mortality recently released by the Children's Bureau of the Department of Health, Education, and Welfare. Data collected by the National Office of Vital Statistics of the Public Health Service were used in the study.

The report shows the two major causes of accidental death in 1949 for children of all ages over 1 year were motor vehicles and drowning. Children under 1 year of age died from accidents of all types at a rate of 72.1 per 100,000; home accidents accounted for 43 per 100,000; fire, explosions, and burns, 9.8; motor vehicles, 6.5. A rate of 28.5 for deaths caused by inhalation or ingestion of objects was reported.

During the period 1940-49 the death rate from accidents among children of ages 1-19 was cut only 16 percent as compared to a 46 percent slash in the rate for all other causes of death among children of these ages.

# Simplifying State Accounting For Federal Health Grants

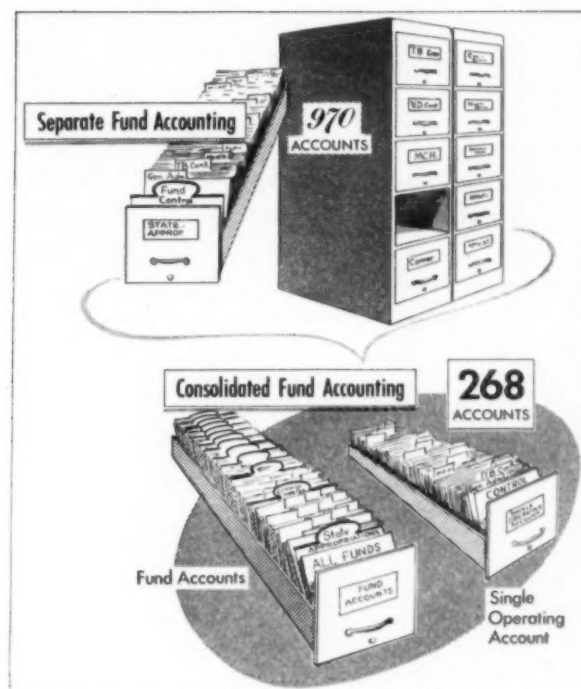
By PAUL E. FOX, M.A.,  
and DANIEL I. ZWICK, M.A.

**A**CCOUNTING SYSTEMS in government generally must provide for the accumulation of fiscal data by purpose, organization, activity, and object. In the health field an example of purpose is prevention and treatment of tuberculosis; of organization, division of tuberculosis control; of activity, mobile X-ray; of object, salaries. The basic accounting unit is the object account. To arrive at a total accounting by purpose, expenditures are posted from vouchers to individual object accounts, then either posted individually or summarized by activity and organization, and finally summarized by purpose. To arrive at a total accounting by organization or activity, the basic

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*Mr. Fox and Mr. Zwick are public health advisers with the grant operations branch, Division of State Grants, Public Health Service. Mr. Fox was with the Cincinnati, Ohio, Bureau of Governmental Research for 10 years before joining the Public Health Service as an administrative analyst. Mr. Zwick came to the Public Health Service after graduation from Harvard University. He conducted field work for this study.*

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figures are brought together from object accounts which are subunits of one or more major purpose funds.

## The Accounting Problem

Accounting for health grants is difficult because funds appropriated for specific purposes are usually spent by multipurpose organizations. The Congress has provided grants-in-aid for purposes specified in various sections of the Social Security, Public Health Service, and Appropriation Acts. These include:

Children's Bureau crippled children's services and maternal and child health services; Public Health Service cancer control, community mental health services, establishment and maintenance of adequate public health services (general health), heart disease control, tuberculosis control, venereal disease control, and water pollution control.

Except for the grants made to establish and maintain public health services (general health), these purposes are defined in terms of applying public health measures to prevent and control specific health hazards or to protect the health of specified groups of individuals. From the standpoint of health administration

such categorization of health activities has some utility in relation to research, dissemination of knowledge concerning particular health hazards and the methods for dealing with them, and the securing of support for public action.

Official health agencies, however, are seldom organized solely along special purpose lines. Executive, supportive, and even substantive program services which contribute to the execution of a particular health program are often provided by organizational units not a part of the specific program staff. Furthermore, local health services are usually carried out by a general staff which has responsibility for conducting a public health operation encompassing all categories of programs.

Accounting in this situation would be greatly simplified under either 1 of 2 conditions: the financing of all programs from one fund, or the administration of each program by a single organizational unit supported from one fund. Neither solution is entirely practicable. Legislative program authorization by major purpose and implementing appropriations usually make financing from one fund impossible. The excessive costs of duplicating specialized personnel (by discipline or by process) make separate administration of each program impractical.

The State health department accountant is therefore faced with a task of setting up an accounting system which produces expenditure data by funds (purpose), responsible organization, activity, and object. To do this requires a great number of detailed accounts. The number of original entry accounts for a typical program is illustrated in the chart by the number of lines leading to the symbols at the bottom representing the various funds. The increase in object accounts, because of the addition of one more fund, or organization, or activity is obvious.

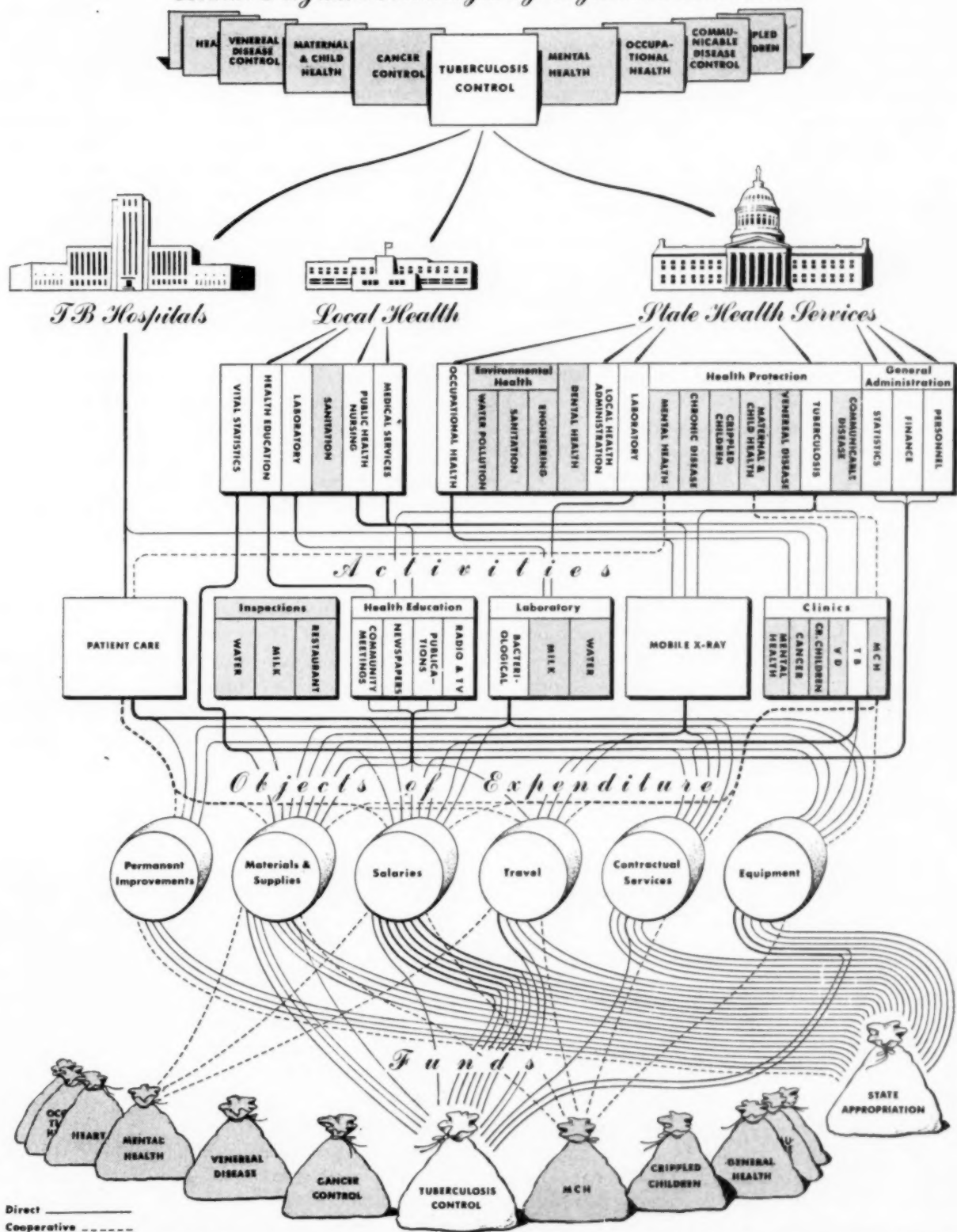
Proper accounting for funds spent on a public health program becomes more difficult when costs of program coordination, administrative staff services, or special professional services must be identified. What the accountant needs is a device which may be adjusted to the necessities of program administration. Fund accounting is too inflexible and cumbersome in complex program situations to justify the

bookkeeping cost involved. Under the fund accounting procedures which were first used in many States it was not unusual to find a local health officer or public health nurse receiving 4 or 5 separate salary checks each pay period. Their services contributed to many programs, and from each they received separate recompense. This situation was improved somewhat by a more judicious budgetary allocation of funds. But there is an accounting concept that can be used to further simplify the handling of special purpose funds in administrative situations in which both general and special purpose activities are involved. This is the concept of the revolving fund.

Application of revolving fund techniques to accounting for special purpose health grants depends upon the ability of the grantee to make disbursements for salaries, supplies, contractual services, rentals, equipment, and other items, from a single account. Federal requirements which originally prevented any application of revolving fund techniques to grant fund accounting have been eliminated through a series of amendments to the grant-in-aid regulations. First, a requirement that State accounting and disbursing officials maintain separate and distinct fund accounts was amended in 1943 to permit State treasurers to consolidate grant funds with other moneys in accounting for the custody of cash received by the States. Then, in 1949 the commingling of grant funds to the extent of consolidating all health grants in one account on the books of the principal State accounting officer was permitted. At the discretion of the State, the State health executive may now be the only State official responsible for keeping a separate account for the receipt and disbursement of each health grant.

With Federal requirements no longer a barrier to the use of simpler fund accounting techniques, in 1951 the grant operations branch of the Division of State Grants of the Public Health Service approached a few fiscal officers of State health departments to discover if they found the idea of a single grant operating account feasible and worth special study. Individual fiscal officers and members of the Subcommittee on Fiscal Affairs of the Federal Relations Committee of the Conference of State and Territorial Health Officers ap-

# Health Programs Authorized by Legislative Enactment



Schematic illustration of accounting complexities in financing a public health program, as illustrated by tuberculosis control.



proved the idea of a special study to determine how accounting practices could be simplified and still maintain the necessary accounting to the Federal agencies. Between September 1951 and August 1952 a study was conducted of fiscal practices used by selected State health departments.

### Single Operating Account Requirements

Two prerequisites for use of a "revolving fund" in grant accounting are: (a) individual fund participation in the costs of defined multipurpose activities, and (b) adoption of an acceptable plan for allocating total costs among several programs. The use of categorical grants to support a portion of such defined costs presupposes sufficient flexibility in State accounting practices to permit either the commingling of funds in one operating account or interfund transfers based upon an equitable distribution of costs charged originally to a single appropriation account.

The method of establishing an account from which all items of defined costs are paid, and into which revenues from all participating sources are received, will vary according to permissible State practices. A single account in which revenues from both Federal and State sources may be commingled is the best arrangement. Whether such a joint account is established by means of advances from all revenue sources or whether all expenses are paid originally from a State appropriation account, which is then reimbursed from the other participating accounts, is immaterial to the successful application of the single operating account principle.

Even when such a full degree of fund consolidation is impossible because of State accounting practices, a more limited application of the principle can be adopted. For example, revenues from the various Federal health grants might be commingled to make a disbursing account. If the inclusion of both Children's Bureau and Public Health Service grants in one account is not possible, a consolidation limited to funds received from one of the Federal agencies might be possible. The broader the scope is of a Federal health grant consolidation into the single operating account, however, the

greater the operating benefits which will accrue.

The type of expenditures to be charged to the single operating account will vary according to the method selected by the State. If a special account is established into which advances are made from several participating revenue sources, a definition of allowable expenditures designed particularly for this account should be developed. In this way restrictions surrounding the use of grant-in-aid funds can be recognized and some difficulties in the allocation of costs avoided. For example, expenditures for the hospitalization of cancer patients, except for a 3-day period for diagnosis, could be excluded from the area of allowable costs to be charged to the single operating account. On the other hand, if a State appropriation account is used initially to meet all operating costs, limiting of grant fund participation to allowable costs becomes a function of the reimbursement procedure rather than a function of the definition of allowable expenditures which establishes the scope of the single operating account.

The key to successful commingling of funds in a single operating account is the procedure for allocating expenditures among participating sources. Development of an allocation plan involves several considerations. Allowable costs must be defined for each participating revenue source. Definitions may identify specific items of expenditures or project totals contributing to a particular categorical program. They may also identify the type of general or staff service from which a participating program receives benefits, for example, finance, personnel, nursing, nutrition, and local health services. The value of program benefits received from general and staff services, both State and local, in each of the identified areas of allowable costs must be determined. Judgment of program benefits may be based on data from either planned projects or past experience. Some such determinations are relatively simple; others will involve some research. A method to divide expenditures among the participating revenue sources must be established. This procedure should insure the distribution of total expenditures at the end of the year in line with actual program benefits received from operations financed by the single operating account.

During the year budget estimates may be used as a basis for percentage distributions. At the end of the year, however, it is essential that the distributions be consistent with actual program experience.

### **Advantages of a Single Operating Account**

The most obvious advantage of a single operating account is the potential reduction in the number of original entry accounts which must be maintained. The possible reduction for a hypothetical accounting system which involves 10 funds, 16 organizational units, and 5 object classes of expenditures is illustrated on page 1071. Obviously, this illustration is not presented as representative of an actual accounting situation. In fact 10 funds are substantially fewer than exist in most States. Furthermore, accounting for special activities within a fund or as subdivisions within organizational unit accounts is not illustrated. Also the use of five object classes is most conservative. Despite general simplification of the real problem, the figure illustrates the substantial reduction in the number of accounts which can be achieved by use of a single operating account. The extent of such reduction depends upon the number of funds contributing to the single operating account. Savings in posting operations are related to the elimination of detailed expenditure accounts required by State accounting officials to reflect accountability by funds.

The second advantage in the use of the single operating account accrues from the simplified processing of fiscal documents. Individual items of expense are all charged to the single operating account rather than divided among several fund accounts. Coding is therefore facilitated by the reduction in the number of codes. Thus, the effort involved in assigning and charging individual expense items to the proper source of funds is drastically reduced and can be performed by less experienced personnel. Postings also are made easier and faster by a major reduction in the number of ledger cards used in daily operations. Payment is further expedited as accounting complexities may be handled through periodic summaries.

A third benefit which can accrue from the use of a single operating account is the easier ad-

justment of charges for categorical services as the program changes. Under the proposed method charges are not made finally to a particular fund until after the services are provided. This allows time for periodic reviews of performance in relation to budget plans before all the accounting processes are completed. Adjustments in fund accounting to reflect program changes may then be made by amending the allocation plan. Because of this flexibility the accounting record may reflect more readily the actual cost of program operation.

As a byproduct the budgeting procedure also may be simplified through the use of the single operating account. There would be no need to allocate individual items of expenditure to particular fund accounts within the budget of a given project; it would be necessary only to indicate the share of the program costs that should be charged in total. Even though specialized items of expenditures may be included in the allocation plan they need not be identified within the program budgets. The development and adjustment of an allocation plan will automatically take advantage of such specialized expenditures.

The reporting of meaningful fiscal information to program directors could be improved from a single operating account. By this device attention is focused on the support given to total operations from the several available funds. Consideration of the use of particular funds for the purchasing of individual objects of expense is avoided. At the same time a better understanding of total program costs is encouraged.

### **Disadvantages of a Single Operating Account**

Accounting for the use of Federal grant funds through a single operating account has certain disadvantages. For one thing the sheer volume of transactions makes the location of posting errors more difficult. Obviously, when the original postings are divided into many fund segments it is easier to isolate errors. For this reason also the task of reconciling receipts, expenditures, and the balance of the single operating account at the end of an accounting period might be more time consuming than reconciling a series of fund accounts. The volume of transactions lengthens the list of

items in transit. Therefore, more time is likely to be required in searching out differences between postings by the health department and postings on the books of the State accounting officer. The greater the number of funds, the more points there are for reconciliation and the smaller the area of search.

Another disadvantage of the single operating account is the insertion of an additional step in the preparation of quarterly reports. Before an accounting of expenditures by funds can be made, charges to the single operating account for an accounting period must be distributed on a worksheet in accordance with the allocation plan. Only then can transfer entries be made charging each fund with its proper proportion of the total expenditures. With experience, however, this procedure will become routine and should not be a major problem in the handling of quarterly reports.

The process of budget adjustment may become more complicated. Transfers of funds from and to projects, even though made from a single revenue source, can affect the total allocation plan for a particular project. When this happens a revision in the percentage distributions used to determine the proportion of costs chargeable to each of the supporting revenue sources may be necessary. Adjustment of the allocation plan for a given program can be postponed until the end of a fiscal year. At that time the percentage distribution must be consistent with the year's operations. If program changes have invalidated the original budget estimates, adjustments must be made. On the other hand, a procedure for interim adjustment of the allocation plan can be used. For obvious reasons changes at the beginning of a quarter would be preferable to more frequent revisions.

#### **Current State Practices**

Several State health departments were found to be applying successfully various techniques which wholly or partially represent the use of a single operating account. Tennessee, for example, uses a system whereby all expenditures are charged initially to the State appropriation account. As requisitions and vouchers are processed, expenditures are allocated among the

various fund sources on the basis of percentage distributions established from the budgets. At the end of each quarter, transfers to the State appropriation account from the various fund accounts are made on the books of the director of accounts. This illustrates the use of a State appropriation account as a single operating account. In a State which operates under a quarterly allotment system, it may involve the director of accounts' acceptance of a temporary overdraft in the State allotment account.

California has a similar plan for charging the costs of State level operations originally to the State general fund. The mechanics of operation differ from those used in Tennessee, but the principle involved is the same. Reimbursements to the general fund are made quarterly from other funds participating in "joint cost" activities on the basis of "plan of operation" approved by the director of finance and the State comptroller. The staff of the California Department of Finance took an active part in the development and installation of this system.

In Georgia, the single operating account principle is used in accounting for State salaries and travel. Project budgets for the various organizational units of the State health department contain only salary and travel items. Monthly payments for these expenses are met from State appropriations. These charges are prorated immediately by project against the respective fund accounts, and checks are drawn to reimburse the State deposit account from the several Federal deposit accounts.

A different approach to the use of a single operating account has been put into experimental use by Oklahoma and Missouri for the fiscal year 1953. These State health departments have arranged to consolidate their Federal grants into a single account on the books of their respective State accounting officers. Expenditures charged to the consolidated Federal grant account are allocated each quarter among the respective separate grant accounts kept by the health department. Total expenditures for projects are distributed in accordance with percentages derived from budgeted Federal fund participation. The results of the project distributions are summarized to arrive at the amounts to be charged to the sepa-



rate Federal grant accounts kept by the State health departments.

A more limited use of the technique described in this paper is being tried by the Kansas State Health Department. The Kansas experiment involves reduction of the several Children's Bureau and Public Health Service Federal grant accounts to two: one for grants received from the Children's Bureau and the other for grants received from the Public Health Service.

### Conclusions

Program administration may be expedited by use of a single operating account. This permits program financing to be given a general fund orientation in contrast to detailed consideration of special purpose fund accountability.

Each separate and distinct fund account kept by the principal State accounting officer to which must be charged individual items of expense adds to the accounting load of the State health department in geometric proportions. The objective of the single operating account procedure is to reduce the number of such separate fund accounts to the minimum permitted by State accounting practices.

Federal regulations and State accounting practices as regards public health grants will

generally permit the adaptation of revolving fund techniques to the accounting for Federal grant funds. The extent to which such adaptations may be made by individual States will vary. Experience of several States with various applications of the single operating account technique attests its usefulness.

The basic requirements for conversion from a system of separate fund accounting to the single operating account are the definition of allowable costs and the construction of a sound plan for allocation of total allowable expenditures.

State health departments and State accounting officers who are not using the techniques described can profitably look into the possibilities of modifying their accounting practices to utilize a single operating account. The general objective of having Federal fund expenditures participating on a reimbursement basis in certain broad areas of allowable costs can be achieved in a number of different ways which take into account the limitations or modifications imposed by present accounting restrictions. With ingenuity and persistence, accounting modifications can be made from which will accrue large dividends in savings of staff time and effort devoted to the processing of documents and posting of accounts.

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## Juvenile Delinquency Rate Increase

Of every 50 children aged 10 to 17 (385,000 youngsters) 1 went to court in 1952.

This estimate by Dr. Martha M. Eliot, chief of the Children's Bureau, U. S. Department of Health, Education, and Welfare, is based on the experience of 342 courts throughout the country regularly reporting to the bureau. It represents an increase of 10 percent over 1951 and 29 percent over 1948.

Shortages in child welfare workers and in probation officers, overworked courts and understaffed police units, and overcrowded training schools or training schools that lack the staff to do a good job were cited by Dr. Eliot as conditions that will have to be faced realistically and not left to chance for improvement.



# Nature and Purpose of Local Health Unit Record and Report Systems

*Largely by means of excerpts, the author of the concurrently issued Public Health Monograph presents here the main points of her thesis that records and reports are basic elements in any health department operation, that they require the thoughtful consideration and imaginative evaluation not only of those who maintain them but also of those who create and utilize them. On page 1081 the content of the monograph is outlined.*

*Records and reports represent an important aspect of public health administration. A more active exchange of experience and observations by means of technical papers and critical evaluations would tend to improve and strengthen current practice. The editors of Public Health Reports are prepared to facilitate such an exchange and will welcome receipt of appropriate manuscripts.*

• • •

Records aid in promoting continuity of service and provide source material for periodic and special analytical reports. Thus, records and statistical reports may be looked upon as distinct entities: Records are written statements noting facts and events pertaining to an individual or establishment. Reports are accounts, statistical summaries, or statements of relationships of pertinent material obtained from records.

Medical and nursing records in local health departments contain entries of the findings, observations, services given, and recommendations regarding individuals and members of their families; sanitation records contain entries of the findings, recommendations, and action of the health department regarding premises and establishments. These records are used by:

*Medical staff* to refer to the past history of the individual, to provide a source of data for special epidemiological and other research



Public Health  
MONOGRAPH

## No. 15

The accompanying summary covers the principal findings presented in Public Health Monograph No. 15, published concurrently with this issue of Public Health Reports. The author now is chief medical record librarian in the Clinical Center, National Institutes of Health. Between 1946 and 1951, she conducted surveys and demonstration projects for the Division of Public Health Methods and the Division of State Grants of the Public Health Service in the organization of record and report systems in local health departments. This monograph, which includes an index and 38 figures illustrating forms, equipment, and systems used by these health departments, presents her findings and recommendations.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and the major universities and in selected public libraries.

Johnson, Olive G.: Records and reports of local health departments. Public Health Monograph No. 15 (Public Health Service Publication No. 285). 92 pages. Illustrations. U. S. Government Printing Office, Washington, 1953. Price 45 cents.

studies, and to furnish materials for resident training and staff education.

*Nursing staff* to provide a tool for adequate nursing service to the individual and his family and for correlation of nursing services with the services given by other members of the health department staff, to furnish a means of integrating health department services with those of other agencies in the community, and to provide material which will aid in the inservice training and supervision of the staff.

*Sanitation staff* to provide source material for analyzing program operations, special problems, and personnel activities, and to furnish data for staff education.

*Administrative staff* to provide a source of information that is necessary for administrative coordination and control of each program, for evaluation of services furnished, for evidence in legal action, and for information to be used in answering authorized requests from other agencies.

Reports measure the services given by the local health department. They are needed to evaluate the general and specific programs of each division of the department in relation to the needs of the community, to determine the problems arising in each program, to direct the programs toward future needs, to analyze services in relation to administrative procedures and costs, to evaluate the achievements of department personnel and the efficiency of each division, to compare activities of the department with the work of similar agencies, and to provide material for public information and health education. Individual and family records form the basis for reports.

### Basic Problems

Self-appraisal of record and report systems in local health departments has revealed that existing records and reports frequently are not meeting the health department needs. Staff members are becoming increasingly aware that records and reports serve their purpose only when they meet the specific needs of the administrative, medical, nursing, and sanitation staffs.

The objectives of the organization determine the content and function of records and re-

ports. Content and function, in turn, determine the source of material, the method of recording, the data to be recorded, the number of personnel to be employed, and the systems, methods, and procedures to be developed. To adopt a form or a procedure without considering the preliminary steps breeds confusion and waste. It is just as inconsistent to continue the same procedures year after year without reviewing the objectives.

However, many local health departments have maintained the record and report procedures started many years ago to assist in serving and appraising the programs then in existence. Since communicable disease was the focus of attention, service was directed to the case. Each case was considered an entity, and for some individuals several records were on file. This type of record system is a handicap to the health workers of today because current programs are directing attention to the individual and his family. A longer time period is involved; socioeconomic factors must be considered. The value of a continuous record of services given to each individual is recognized. Reference to these records reveals information on the individual's health history, social and economic problems, previous illnesses, results of diagnostic tests and therapy, and staff recommendations. When the records are not combined, it is difficult for the attending physician and nurse to refer to all records of an individual. There is frequently no way of knowing that the person has been seen or is at present being seen by another staff member. Duplications of service and of diagnostic tests may result; contrary recommendations may be made.

Similarly, the statistical reports that are prepared in many health departments were created and have been developed primarily to obtain a count of services given. The type of report which results does not present the data that are essential today. There is a continuing need to study the objectives of each program to determine the data necessary for evaluating service given and determining service and personnel required.

No health department can satisfactorily adopt the record and report forms or systems of another health organization without analysis of the suitability or usefulness of the data re-

corded for its own purposes. To be of value, records and reports must reflect the programs and objectives of each organization.

### Central Administration

In many health departments, each division maintains records and administers what it considers necessary record procedures. One result is that service records are filed in separate locations. In addition, methods and procedures often vary among the divisions, each compiling data for its respective services. Since the sources of the data frequently vary, as do the definitions used, there is seldom comparability of material within a health department. It is not uncommon to discover that two or more divisions in a health department, each compiling its own reports, use different units—activity, case, individual, family—to represent service given. Duplication and waste result from this practice.

In many instances, better coordination of health services and greater cooperation among personnel can be achieved through centralized responsibility, with one person supervising the installation of record and report systems and devising and maintaining procedures.

### Essentials of Management

The importance and value of records and reports must be recognized by every member of the health department staff. "Individuals forget—records remember" is the reason for maintaining records. In addition to their use in introducing an individual to the "new" physician and nurse on the staff and in refreshing the memory of staff personnel who have previously served the individual, records are the source for reports through which results—and the reason for results—may be determined.

Directors of health departments are becoming more and more aware of the need for advance planning to develop standards and procedures for record and report systems. Many administrators have appointed a record committee and have designated one person to be in charge of the office of records and reports. These two steps are essential for the proper administration of record and report systems.

### The Record Committee

In a large department, the record committee would include representatives of division directors and of the administrative, medical, and nursing staffs; the statistician; and the supervisor of the office of records and reports. A committee with no less than 5 and no more than 10 members seems to achieve the best results. In a small department, the health director, chief nurse, chief sanitarian, and record clerk should be the members of the committee. Regardless of size of department, however, the basic principles and responsibilities are the same.

The duties and responsibilities assigned to the committee may include: study and recommendations as to the need for records and reports, decisions as to the type of statistical summaries which will be of assistance in evaluating the results of service and in the planning of new programs, and decisions as to the specific data which will be of service to the health department staff and to the individual served. Concurrent with analysis of the type of data needed for records and reports, a review of the value of existing records and reports may be accomplished to determine if their use justifies their cost. In addition, this committee may approve all forms used for service records and may formulate definitions of terms used within the health department for recommendation to the director.

### The Supervisor of Records

The appointment of one person to supervise service records—to be responsible for the examination of records for completeness and accuracy, the development of methods and procedures for their flow between offices and clinics, the release of confidential data from records, and compilation of reports—represents a concrete step toward coordination of health department services.

The person in charge of reports may conduct special conferences at which the chiefs of divisions may express their need for specific data. Duplications can be eliminated, uniformity established, and more efficient utilization of available facilities achieved. This individual may also be responsible for supervising and



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## Outline of Content of Public Health Monograph No. 15

Many local health departments have recently studied their record and report systems and have found it necessary and desirable to develop simpler, more effective, and more adaptable procedures. Findings and recommendations presented in Public Health Monograph No. 15, "Records and Reports of Local Health Departments—Criteria and Methods for Organization, Maintenance, and Use," are based on surveys of systems used in 25 local health departments in 8 States and on demonstration projects in a city and a city-county health organization, which were conducted at the request of the State and local health departments concerned. The studies and demonstrations were sponsored by the Division of Public Health Methods and the Division of State Grants of the Public Health Service.

The monograph illustrates a method in which the staff of various divisions of a health department, working in collaboration, critically examine each record and report maintained by the department. This self-appraisal is considered as an essential step in improving the usefulness of each record and in developing a system of records and reports that will meet the needs of all units of the health department. Principles of organization and detailed explanations of the mechanics of recordkeeping are given. The principles and methods described are not dependent on the size of organizations involved; they are applicable equally to small and large health departments.

Application of principles as carried out in a demonstration project—a city health department serving a population of over 500,000—is described

in some detail, beginning with the initiation of the project. Considerations involved in installing the record and report systems are reviewed, with discussion of problems associated with selecting and tabulating minimum data and with establishing an office of records and reports. The record and report procedures followed by each person concerned are outlined.

Supplementing this demonstration area material are six "case studies" illustrative of the greater accessibility, uniformity, and usefulness of local health department records which can be achieved through reorganization. Diagrammatic representations of the systems support the examples, which are:

Case I. Medical and nursing records in a health center in a city-county health department.

Case II. Medical and nursing records in a three-county unit health department.

Case III. Medical and nursing records in a health center in a city-county health department.

Case IV. Sanitation records in a city-county health department.

Case V. Establishing a central index in a city-county health department.

Case VI. Facilitating interchange of information among a health organization's units.

Included in the appendix to the monograph is a statement of basic principles governing service statistics in public health, as prepared by a working group of the Public Health Conference on Records and Statistics in 1951.

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training clerical personnel. Central control of clerical services should facilitate the installation of standard procedures and aid in the elimination of duplication. It should also permit greater utilization of clerks by making possible the transfer of employees from one office to another, for example, during the time of the day when there is a peak load in one office and a slack period in another or when an employee is absent from duty.

### Meeting Community Needs Economically

Recognition of the adequacy or inadequacy of existing systems is an essential step in determining the need for records and reports. This often leads to clarification of problems existing in the administration of health services and frequently results in coordination, increased efficiency, and economy of services.

Health department services—and, reflecting



these services, their record and report systems—vary with community population and habits, climate and topography, natural resources, and the available personnel, facilities, and functions of other health agencies in the community. The variance among programs in scope and development emphasizes the value of analyzing activities and achievements against

the background of community requirements. Analytical reports, in addition, can serve as tools for the evaluation of performance of staff members, can aid in the study of administrative procedures, and can furnish data essential for informing the community of its resources for health service and unmet needs.

—By OLIVE G. JOHNSON

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# The Growth of Local Health Units in Florida

By WILSON T. SOWDER, M.D., M.P.H.

TO A CONSIDERABLE DEGREE, any separation of local health services from services provided by other government echelons is artificial and somewhat illusory. Perhaps some persons interested in the subject would define local health services as those that are completely financed and administered by local governments. If such a definition is accepted and interpreted strictly, Florida would have few local health services to report. In fact, there are few public health services in the State which are not supported to some extent, directly or indirectly, by State or Federal funds and which are free entirely from some legal control, under State or Federal laws. In this paper, therefore, will be described the development of those public health services which are financed and administered, in whole or in part, by local governmental agencies; and it will be left to the reader to accept or reject this definition.

Facts about local health services during the several centuries of the Spanish regime and during the brief British occupation are fragmentary or lacking. However, in 1821, Gen-

eral Andrew Jackson, in his capacity as Governor of the Territory, issued a proclamation setting up a board of health in Pensacola and appointing a health officer.

The present State constitution, which was adopted in 1885, not only provides for a State board of health, to have supervision over all public health matters in the State, but also provides that county boards of health "may be established." The State board of health was established by legislative action in 1889, after a severe yellow fever epidemic, and county boards of health were provided for by statute and appointed within the next several years.

However, even before the turn of the century, the State health officer had recommended the abolition of the county boards of health and the legislature had complied. This course was taken because each county board of health had not only adopted its own regulations for the control of communicable diseases, especially yellow fever, but these regulations were enforced with varying degrees of zeal, usually too much. Most funds and energy were spent on quarantine procedures, with special emphasis on the exclusion of travelers and goods from areas suspected of infection, and written permission was necessary from each county involved before travel could be undertaken. Such actions resulted in "Iron Curtains" between the counties of the State, since communicable diseases were frequently present and oftener rumored. The abolition of county boards of health was therefore probably quite justified and necessary in order to end this state of chaos, and to bring about uniformity in

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*Dr. Sowder has been State health officer of Florida since 1945. Previously, he served in various national and regional venereal disease control posts, and in State and local health department assignments, including that of health officer of Hillsborough County, Fla., in 1941-42. He was commissioned in the Public Health Service in 1934 and is on leave to serve in his present post.*

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**Table 1. Growth of county health units in Florida from 1930 to 1953, at 5-year intervals**

Year	Number of organized counties <sup>1</sup>	Population served <sup>2</sup>		Total expenditures <sup>3</sup>	Number of persons employed <sup>1</sup>
		Number	Percent		
1930-----	1	13, 136	1	\$9, 000	4
1935-----	3	76, 129	5	41, 903	29
1940-----	25	618, 541	33	329, 654	147
1945-----	36	1, 510, 520	67	1, 243, 104	482
1950-----	64	2, 511, 898	91	2, 733, 325	755
1953-----	66	2, 879, 880	93	<sup>4</sup> 3, 674, 320	796

<sup>1</sup> Status as of December 31.

<sup>2</sup> Population figures from Federal censuses of 1930, 1940, and 1950; State censuses of 1935 and 1945; and estimated data for 1953. Population of cities with independent health departments excluded, except where services limited and majority of services provided by county health department.

<sup>3</sup> Expenditures are for the fiscal year beginning July 1.

<sup>4</sup> Estimated.

health laws, regulations, and practices throughout Florida. Following this action, for the next 30 years and more, except in the larger cities and towns, public health services were provided by persons employed directly by the State board of health.

#### County Health Departments

The present era of local health administration began in 1930 with the passage of a State law authorizing joint financing between counties and administration of county health units by boards of county commissioners and the State board of health, and cooperation with

cities. Funds were to be deposited in the State treasury to the credit of the county involved. Minimum personnel required included a physician, a public health nurse, a sanitary officer, and a clerk, who were required to devote their entire time to public health work. Personnel were to be appointed by boards of county commissioners with the approval of the State health officer and their salaries were to be fixed by the State health officer with the approval of the board of county commissioners. Multicounty units were authorized with common budgets and personnel.

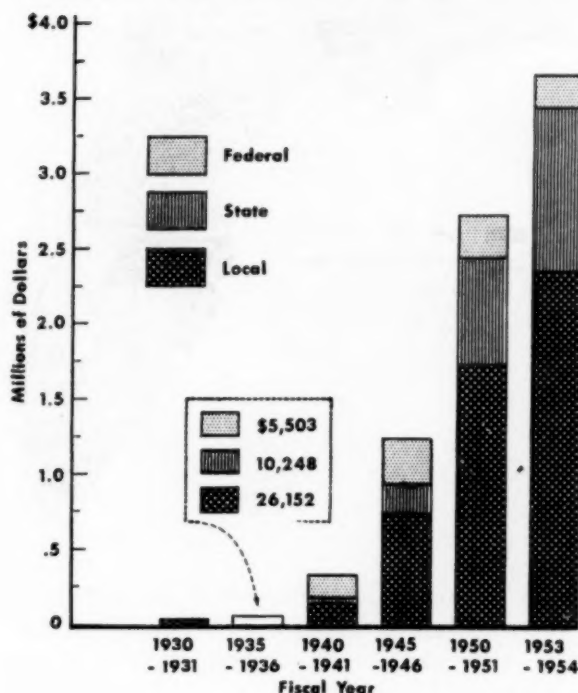
This excellent law has been so entirely satisfactory that no attempt has ever been made to

**Table 2. Total and per capita expenditures of Florida county health units, by source of funds, at 5-year intervals, 1930-53**

Source of funds	Fiscal year					
	1930-31	1935-36	1940-41	1945-46	1950-51	1953-54 <sup>1</sup>
Total expenditures						
Total-----	\$9, 000	\$41, 903	\$329, 654	\$1, 243, 104	\$2, 733, 325	\$3, 674, 320
Federal-----	9, 000	5, 503	148, 911	297, 879	272, 832	208, 680
State-----		10, 248	47, 836	201, 246	727, 075	1, 090, 220
Local-----		26, 152	132, 907	743, 979	1, 733, 418	2, 375, 420
Per capita expenditures						
Total-----	\$0. 69	\$0. 55	\$0. 53	\$0. 82	\$1. 09	\$1. 28
Federal-----	. 69	. 07	. 24	. 20	. 11	. 07
State-----		. 13	. 08	. 13	. 29	. 38
Local-----		. 34	. 21	. 49	. 69	. 82

<sup>1</sup> Estimated.

**Figure 1. Total expenditures and source of funds of Florida county health units. (All 1930-31 funds were from Federal sources.)**



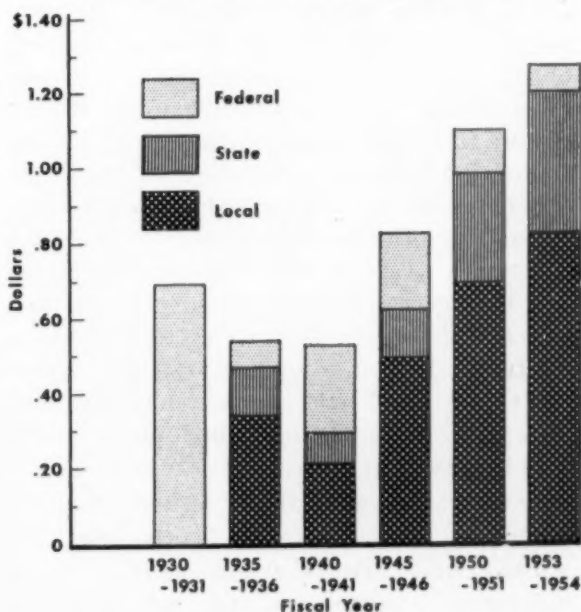
change it. Soon after its passage the first health unit was established in Taylor County, a small rural county in west Florida. Although this unit was discontinued after a short existence, it was soon reinstated and there has been a steady growth of the county health unit system since the passage of the county health unit enabling act. Table 1 shows concisely the increase in the number of organized counties among Florida's 67 counties, the population and percentage of population served, the increase in funds available, and the number of personnel employed. Table 2 shows expenditures and per capita expenditures by source, for each of the 5-year periods since 1930. Figure 1 shows graphically the expenditures for county health units for the period and the source of funds, Federal, State and local. Figure 2 shows the per capita expenditures by county health units and the sources, Federal, State and local. In interpreting these charts it should be kept in mind that Florida's population has increased rapidly. According to the Federal census, in 1930, the increase was 1,468,211; in 1940, 1,897,414; and in 1950, 2,771,305.

It should not be assumed that per capita expenditures are uniform among the counties of the State. On the contrary, there is a wide variation. Local appropriations vary from a minimum of 34 cents per capita to a maximum of \$1.89 per capita; and the total of Federal and State funds allocated to local health departments varies from a minimum of 23 cents per capita to a maximum of \$1.78 per capita. State and Federal funds are distributed among the counties on a formula basis, according to the population of the county, the per capita amount decreasing with increase in population. In order to encourage local appropriations, the formula includes a matching factor so that larger per capita local appropriations are matched by somewhat more State and Federal funds. The smallest grant of State and Federal funds (1953-54) is \$3,915 and the largest, \$114,466.

Additional funds not shown in the tables and charts are also allocated on a project basis to 12 of the larger counties for special programs which are conducted on a regional basis. These programs include cancer, heart disease control, and mental health, and the total funds so allocated during the present fiscal year (1953-54) amount to \$99,900.

Direct aid to local health departments in

**Figure 2. Per capita expenditures and source of funds of Florida county health units.**







the school health program was brought about with the cooperation and agreement of all concerned. A law was passed which applied to Dade County only and which effectively removed any legal barriers to the consolidation. The law also set up an advisory board which functions as a local board of health except that it has no administrative functions or authority to promulgate regulations.

Under this plan the county undertook the entire responsibility for financing the operations of the health department, except for available Federal and State funds. This arrangement has worked out so satisfactorily that it has been used as an example of the benefit of consolidating the city and county governments entirely, and this development failed by a narrow margin in a recent election.

A similar development started somewhat earlier in Hillsborough County, whose chief city is Tampa. In spite of some opposition at first from rural areas and from one small town, the consolidation was promoted by the parent-teacher association because of a desire to have better school health services. Past efforts to carry on a separate school health program had not been satisfactory, and school officials were loathe to provide for an expensive school health program which would overlap the activities of the city and county health departments.

A few years later, and without much public fanfare, city and county officials in Pinellas County (St. Petersburg-Clearwater) agreed upon a consolidation, and effected it by legislative action. In this case, a local board of health was provided, the only one in the State.

Even before these consolidations took place, most of the smaller cities and towns in the State had effected similar arrangements by negotiation and agreement, and without special laws. In Pensacola and Escambia County, for example, a city-county health department was operated for years under a single health officer, with each agency paying its own employees. In recent years city, county, and State appropriations have been put into a common fund. While the trend in recent years has been for the counties to assume the entire local financial burden, in 1953, 27 municipalities contributed a total of \$65,890 to county health department budgets.

Consolidation has not meant that the cities of Florida lack health departments. Acting under specific agreements, and under the general policy of the State board of health, each county health department serves as the municipal health department for each municipality within the county, unless the municipality has a health department of its own. The county health departments are obligated to enforce municipal health ordinances, and in fact the county health departments would be greatly handicapped in their work but for the existence of such ordinances. This is particularly true in the field of milk and food sanitation where there is some dispersion of responsibility among State agencies.

At the present time only the city of Jacksonville has a complete and fairly adequately financed city health department. It has a budget of about \$500,000 to serve a population of more than 200,000 people. The cities of West Palm Beach, Orlando, and Lakeland have city health departments, but these furnish only limited public health services, and their combined budget for this purpose is estimated at less than \$100,000. Public health services in these cities are supplemented by the county health departments. It can be seen, therefore, that of a total of about \$4,339,320 spent by local health agencies in Florida only about \$665,000 is appropriated by municipalities, and most of this is spent by the city of Jacksonville.

### **School Health Services**

Sentiment in Florida has always been against the development of separate school health services financed and administered by education agencies. In the past, many local school boards provided for school health services, particularly public health nursing services. There has been a continuous trend in recent years to discontinue this activity, or to merge such efforts with the county health departments. In many counties, the board of county commissioners bears the entire local cost of public health services, including school health services, but at present in 39 counties the local school boards make a contribution to the common fund of the health department. The total amount so contributed in the 1952-53

budgets was \$142,602. This assistance is especially important since it is contributed primarily in the smaller rural counties.

It is especially interesting that the Florida laws governing the expenditures of school funds provide that these can only be spent for local services where the county health department is unable to provide needed services. At the present time, in only 7 counties are public health personnel employed by school boards other than through county health departments. This personnel consists of 19 public health nurses and 1 health educator. In 1 of these counties, although 4 public health nurses are paid directly by the local school board they work under the supervision of the county health

officer. In the other counties, they work in close cooperation with the personnel of the county health departments, and the outlook for a complete merger of efforts in the future is very bright.

#### Summary

During the past 23 years steady progress has been made toward statewide coverage by county health departments, and only one county, with a population of 27,200, is now unorganized. Similar progress has been made in the coordination and unification of local health services provided by counties, municipalities, local school boards, and the Florida State Board of Health.

## *Birth and Early Days of Florida's First County Health Unit*

By W. H. Y. SMITH, M.D., C.P.H.

WHEN THE Taylor County Health Unit was established in Florida during August 1930, it arrived, with the help of the Public Health Service, on a scene which was not only beginning to feel the full impact of a depression but which was already burdened by an abundance of malaria and hookworm disease.

From this county's swamp swarmed the *Anopheles quadrimaculatus* mosquitoes, and in its sandy soil thrived the hookworm larvae. It was a county rich in its land from the trees, yet poor in its soil that was cultivated. From its great sawmills and lumber towns came the money and from the country came the poor.

The health unit consisted of a motley group of "foreigners." To this unsuspecting community came a nurse from Tennessee, a sanitation officer from Massachusetts, the health officer from Canada, and a secretary who was the only native-born denizen.

In the beginning, the three moving pieces of personnel—the nurse, the sanitation officer, and the health officer—studied their maps and planned their strategy. Then they moved out

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Florida's experience in developing local health services is reviewed by Dr. Sowder in the preceding paper. He speaks of 1930 legislation and establishment that year in Taylor County of the State's first local unit.

This informal account of the creation and early days of the Taylor County Unit is taken from remarks at the 1952 meeting of the Florida Public Health Association by the unit's first health officer, Dr. W. H. Y. Smith, now director of the bureau of preventable diseases in the State Health Department of Alabama.

To pioneers and veterans of the local—and particularly of the rural—health movement, this vignette may evoke a degree of nostalgia. To some who have not had the privilege of working the back roads in some variety of shoe-leather epidemiology, nursing, or sanitation, it may even have an odd and distant tone. But to those who today are dealing, face-to-face, with problems of local health service, many elements and incidents in this flashback to two decades ago will seem remarkably current.

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in their separate ways for personal appearances and good will tours in the county and were greeted quite often with blank stares and a thinly veiled hostility. Yet, there was always the one or the two, uninformed and hookwormy or malarial as he or they might be, who accepted the "pearls of wisdom" that were being dispensed and nodded vigorously and who, almost at once, became an ally and supporter. And with these allies and supporters the beginning was made in the communities.

Sanitation in the towns was relatively good and screening reasonably well done because the lumber industries through past years had learned or had been shown the worthwhileness of such things, and, too, most townspeople were used to such conveniences. But from the edge of one town to the edge of the next industrialized town and through those towns without industries there was a lack of these antihookworm and antimalarial facilities. And most of the people were ignorant in the ways of preventive medicine and health and were resistant to any and all innovations. "What was good enough for pappy is good enough for me" was their determined song. And the string trio of health workers were just as determined to play a new tune. But the tune was a simple melody. Funds were lacking for a great crescendo of music with brass and winds and piano for a mass attack of drainage ditch and privy building. Yet slowly but surely the nurse found her way into homes and the sanitation officer's spot map began to show evidence of privy building.

Then arose a new kind of resistance. The beautiful screened doors were kicked out because mamma couldn't get the door opened fast enough to throw out the dirty dish water or because the screens kept out the fresh air. And the privies went unused. Perhaps, the classic example of the latter was the family of eight who were filled to overflowing with hookworms. They lived deep in the country and were all potbellied and pasty faced. They were too sick for the usual remedy of carbon tetrachloride and so the new drug hexylresorcinol was used. During the several stages of treatment a new and shiny privy was built by the sanitation officer and his helpers, who explained the facts of privy life to the family. They

would nod their heads and smile in simple agreement, but the privy remained unused. One day, the old man explained why. They were so grateful for the return of their health that they couldn't possibly use the beautiful new house that the health unit had built for them for that desecrating purpose.

As a help in getting across the story of health, moving pictures were used. The traveling members of the unit would visit each home and invite everyone to the free pictures. In one home the nurse encountered stonewall resistance when the mother of a brood of hookwormy children said there was no such thing as hookworms, and if there was a moving picture of them it was made up because you couldn't take a picture of something that wasn't.

Interlaced with the educational programs and privy building were the hookworm treatment clinics. Through the schools, class by class, and in the homes, specimen tins were given out and carbon tetrachloride was given to the positives. The list was always long and at times, in some schools, there were no negatives. It was thought that repeated treatments might slow down the infestations even though the privy building program hadn't reached or wasn't yet accepted in the areas. Future survey proved this point.

The antimalaria program moved forward slowly. To accelerate it, quinine clinics were held throughout the county one summer. Once a week the people were met and given quinine capsules and instructed how to take them prophylactically. Neighbor told neighbor and the numbers at the clinic increased week by week. It appeared for a time that this type of clinic was being highly successful because of the crowds. But there was a flaw. Although they were only given enough quinine sulfate for the family for one week of prophylaxis, they didn't use it that way. This was discovered when one man at a clinic refused quinine, saying that he had enough now to last him for years. Apparently they didn't take the medicine as directed but put it on the shelf awaiting the time they would have chills and fever.

Inroads, of course, were made in the other communicable diseases but nothing was done about venereal diseases. Those were the days of men's doctors, secretiveness, and disgrace.



By the end of the first year, the unit was fairly firmly established with many people. But with the county commissioners it was different because the unit was dealing with new officials, not the ones who established it. There were two for, two against, and one on the fence. It was the one on the fence that had to be convinced. So at budget time the commissioner's room was filled with health unit supporters. The country people came on foot and in wagons, and the ones from industry and the clubs came in automobiles. And industry didn't send little wheels, they sent big ones. They all crowded into the little room—well-dressed men and women against a background of faded and patched overalls and shirts and snuff and chewing tobacco. It was hot and stuffy, and the unwashed bodies perspired freely with the washed ones until the commissioners were convinced.

Then the second year rolled around and

there was a repeat performance of the previous year. But industry didn't send such big wheels because it felt the health unit was old enough to stand on its own feet. It should have been, but the grapevine said the commissioners again were divided. But again the pressure was strong enough to continue the work for another year.

When the third year ended, it was decided to turn off the pressure. Either the past performance of health was apparent or it wasn't. To the people it was but not to the commissioners. They threw out the health unit, lock, stock, and barrel and replaced it with a nurse.

It is hard to express the feelings of a group of pioneers in health who tried to do a good job and succeeded only in being considered expendable and unnecessary. But bitterness and resentment were replaced as the feeling of success slowly seeped in again . . . for Taylor County remained without a health unit for just 1 year.

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## ***Public Health Service Staff Announcements***

**Dr. Lloyd D. Felton**, an outstanding authority in bacteriology and immunology and a commissioned officer of the Public Health Service, died September 11, 1953. He devoted his entire career to laboratory research and medical teaching—at Johns Hopkins Medical School, Rockefeller Institute for Medical Research, and Harvard University's Medical School and School of Public Health. Dr. Felton's extensive studies of the virulence of bacteria led to the discovery of the Felton serum used in the treatment of pneumonia. Also, Dr. Felton discovered an antigen for immunization against pneumonia and introduced methods of standardization which enable physicians to determine the proper dosages of antibodies for the treatment of the disease. He contributed much toward the development of the sulfa drugs and during World War I made intensive studies of meningitis for the Army Medical Corps. He had been ill of a heart disease for more than 2 years. Before his illness, he was chief of the pneumonia unit in the Division of Infectious Diseases at the National Institutes of Health from 1938 to 1949. Dr. Felton's home was at 125 E. Thornapple St., Chevy Chase, Md. Burial was in Arlington Cemetery.

**Dr. Albert M. Kessel**, head of the pathological technology section of the laboratory of pathology, National Cancer Institute, Public Health Service, was killed in the crash of a Belgian airliner near Frankfurt, Germany, October 14. His wife and daughter were also killed in the crash. Dr. Kessel, with the National Cancer Institute since 1940, was on a vacation trip to Germany, where he was born in 1909. At the Institute, Dr. Kessel did research work in micro-anatomic fixation techniques and microscope slide staining methods. He was curator and assistant instructor in neuro-anatomy at the Mt. Sinai Hospital in New York City from 1929 to 1936.

**Dr. Byron C. Brunstetter**, secretary of the hematology and pathology study sections, Division of Research Grants, National Institutes of Health, was killed in a plane crash near Albany, N. Y., on September 16, while on an official trip, reviewing the projects of NIH grantees. Dr. Brunstetter had been with the Division of Research Grants staff since 1948, first as chief of the research fellowships branch. Since 1951 he had also served as chairman of the board of civil service examiners at the National Institutes of Health.

# Public Health Aspects of Civil Defense

By DALE C. CAMERON, M.D., M.P.H.

**M**AJOR attacks upon the United States by an enemy possessing weapons of modern warfare could produce millions of casualties, making necessary the provision of both medical care and public health services on a scale unprecedented in the history of the world. Already much planning and preparation have gone into the organization of civil defense health services; but much more has yet to be done.

The primary considerations in this paper are the problems involved in providing public health services. Space does not permit a detailed analysis of the many problems involved in providing emergency medical care, but these problems are inexorably intertwined with the public health problems, as will be evident from the discussion. Basic to an understanding of the health aspects of civil defense is a knowledge of the nature of the threat and the requisites for an adequate defense.

## Nature of Threat

The effectiveness and limitations of weapons which may be used and the targets susceptible

of destruction by these weapons are outlined below, and some comments are made on enemy capabilities and objectives.

## Nature of Weapons

The weapons which must be taken into account in preparing for enemy health services include biological, chemical, radiological, and atomic warfare agents. Since the threat from atomic weapons has been discussed extensively elsewhere (1, 2), this discussion will be limited to other unconventional weapons.

Biological warfare agents include living organisms, toxins, biological products, and chemical plant growth regulators, which may be used to produce deaths or casualties in man, animals, or plants. The possible use of such agents as an instrument of warfare has intrigued the imagination of war planners for centuries. Although disease and epidemics among men have materially affected the course of many wars, recorded instances of deliberate attempts to affect the enemy are few. They provide no objective data on the use and effectiveness of biological agents in actual modern warfare.

Estimates of potential performance of biological agents must rest largely on extrapolation from preventive and treatment experimental data, epidemiology of accidental laboratory infections, hypotheses, and an extensive knowledge of man's ceaseless struggle against human, animal, and crop diseases during the ages. Since most of the problems of waging biological warfare are technical, it must be

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*Dr. Cameron is medical consultant in the Office of Health Emergency Planning, Office of the Surgeon General, Public Health Service. He participated in the preparation of the Project East River Report on Civil Defense for the Department of Defense, the Federal Civil Defense Administration, and the former National Security Resources Board, from November 1951 to June 1952.*

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assumed that they either have been solved or that satisfactory solutions are possible. Civil defense today must therefore take into account the possible use of biological agents.

Chemical warfare agents include toxic chemicals, incendiaries, and smokes, which may be used to produce deaths or casualties in man, to destroy material, or to provide screening operations against enemy weapons or intelligence. Modern chemistry has added materially to the ways in which the ancient and potent weapon of fire can be used. World War I demonstrated conclusively that toxic chemicals also can be used effectively against man and animals. These facts plus the recent development of nerve gas make it imperative that civil defense preparations include provisions for possible attack with chemical agents.

Radiological warfare agents include radioactive materials, other than atomic bombs. These may be used to impair or kill man, animals, or plants, or to deny or impede access to contaminated objects or areas through threat of casualties. If these agents are used against this country, it would probably be primarily to deny or impede access to contaminated areas and to create confusion rather than to produce physical casualties. Radiological warfare is not viewed as nearly as serious a threat as biological, chemical or atomic warfare at the present time.

Viewed as antipersonnel weapons, biological and chemical agents could rival atomic bombs in destructiveness. From the public health point of view, the problems presented by the possible use of biological and chemical agents of warfare are at least as serious as those involved in possible radiological or atomic attack.

#### *Nature of Target*

The targets of these weapons are man, animals, crops, and physical things. Only atomic bombs, high explosives, fire, and certain chemical agents are particularly useful against both living and inanimate targets, but biological and other chemical agents could be used effectively against man, animals, and crops without destroying other things.

Considering man as a target, enormous num-

bers of casualties could result from overt attack with biological or chemical warfare agents, as well as with atomic bombs. Correct use of biological agents by saboteurs could cause large numbers of primary casualties and disruption among selected local population groups, but the secondary spread of disease among men after either covert or overt attack probably would not be especially great, particularly if appropriate public health measures are in effect. The covert use of chemical warfare agents presents more technical difficulties than such use of biological warfare agents.

Animals and fowls are seriously vulnerable to attack with biological agents, and the secondary spread of disease would probably be extensive and fairly rapid. The use of biological warfare agents against crops and forests also appears to present a serious threat if these agents are introduced at the proper time and place by either overt or covert means. The secondary spread of disease among crops and forests is also likely to be extensive, but the buildup would be slower than that among animals.

#### *Enemy Capabilities and Objectives*

The use of these special weapons against us depends not only on the vulnerability of targets but on the enemy's capabilities of production and delivery and upon his objectives and intent. Little can be said about enemy capabilities, but scientific knowledge concerning biological, chemical, and atomic warfare is not restricted to the free nations. Public statements have been made by Government officials to the effect that a potential adversary probably has the ability to deliver whatever weapons he has available (3, 4). Thus it is important not to underestimate enemy capabilities.

An enemy's objectives and intent, together with enemy capabilities and target vulnerability, play a vital role in our defense efforts. People will prepare to defend themselves against a particular threat only if they perceive it as real and relatively imminent. Perhaps some of our delay in the development of an effective biological and chemical warfare defense is predicated on a general belief that an enemy would not wish to use such agents on our vul-



nerable targets even if he had the weapons and means of delivery. Consideration of an enemy's objectives and intent is in the realm of pure speculation, but two points deserve mention.

One of these is the possibility of a future world war being based on a different concept from those of the past. The past two wars were waged primarily against things. An effort was made to destroy the productive capacity of nations, a concept brought sharply into focus by strategic bombing to destroy vital links in the production machine. True, men who were in the way were killed or injured, but the primary target, generally, was the industrial productive capacity. The result has been that many countries, victorious and vanquished alike, have required outside aid during the post-war period in providing food and clothing for their people and in rehabilitating their industries. Many of these postwar sequelae could be avoided by waging a war primarily against man, with the result that the survivors would be fewer in number and would probably have ample physical resources for their sustenance.

It may be argued that our enemies would not attempt to assist this country as we have tried to assist war-torn countries in the past, and this is probably true as far as humanitarian motives are concerned. But consider why potential foes would want to conquer this Nation. It seems reasonable to assume that their purpose would be to control our productivity in order that they might exploit our economy for their benefit. If this be true, then it also seems reasonable to assume that potential enemies might be interested in preserving, insofar as possible, our industrial capacity, and that, therefore, a future war might be against man rather than against things. Chemical and biological agents would become particularly attractive weapons in such a war.

A second point to be considered in speculating on enemy objectives is the fact that biological and chemical agents, particularly the former, lend themselves admirably to covert attack. The possibilities of weapons particularly useful as covert agents surely would not go unrecognized by an enemy who has a penchant for doing everything possible within his means, short of all-out war, to achieve his ends.

## Requisites for Civil Defense

Both military measures and civil measures are necessary for the provision of an adequate defense against enemy attack with modern warfare weapons.

### *Military Measures*

Dr. Lloyd V. Berkner in an address at the Minnesota World Affairs Center, University of Minnesota, on September 29, 1952, pointed out that the single most important military factor in our present foreign policy is the development of a strategic striking force (5). He noted further, however, that regardless of the merits of this concept, there comes a time when this approach is not enough. When an enemy has built up a sufficiently large striking force of his own to deliver a "knockout blow," the threat of retaliation loses much of its meaning. Thus, not only must this country develop a strong right arm, but it must also have an effective shield so that it may survive to use the strong right arm.

Such a shield is essential not only from the foreign policy point of view but also from the civil defense standpoint. Only with such a shield can the civil defense problem be made manageable. This country does not have unlimited personnel and physical resources to expend on civil defense efforts. If civil defense is to be successful, the magnitude of the task must be manageable. Any leak through our defensive shield must not completely inundate our civil defense system.

### *Civil Measures*

In addition to the military measures precedent to a manageable civil defense, the following civil measures are essential:

Sufficient warning must be given of an overt attack, preferably of at least an hour, to allow civil protective measures to be taken. The provision of such warning, however, may well be a military rather than a civil responsibility.

Attack with biological or chemical agents must be detected promptly and the public immediately informed of the attack.

Proper protective devices, such as gas masks and shelters, should be available. Masks appear to be the single most effective and feasible



protective device against overt biological and chemical warfare.

Every individual must know what action is expected of him in the event of attack not only by atomic weapons but also by biological, chemical, or radiological weapons, which remain "unknowns" to most civilians. As such, they tend to cause widespread speculation as to their destructiveness and to engender unreasoning fear in many people. If civilians are to react rationally, they must have adequate knowledge about the nature of these weapons and their capabilities and limitations.

Health personnel must be prepared to deal with the emergency situation; plans for utilization of health facilities must exist; and certain medical supplies must be available.

### **Public Health Problems**

Among the civil defense problems with which public health officials will be concerned are the provision of safe water; sewage collection and disposal; garbage and refuse storage, collection, and disposal; food sanitation; control of insects and rodents; household sanitation; detection and identification of illnesses; laboratory services; and prophylactic services. Most of these are essentially local community problems.

#### *Public Water Supply*

To maintain a supply of water adequate in quantity and pressure for fire fighting and, at the same time, to make sure that water does not become a vehicle for the mass transmission of disease, will be a major civil defense problem. Any decision to introduce unpotable water into the water distribution system for fire-fighting purposes should be made on the basis of policies developed jointly by the health, water, and fire departments. The problems occasioned by contaminated water supply systems must be carefully weighed against possible losses from fire. These departments should also collaborate on the development of alternate sources of water supply and measures to protect and repair the water system.

Provision should be made for the emergency purification of water by chlorination and other methods, using portable or fixed equipment, so that medical and other civil defense services,

hospitals, welfare mass-care facilities, restaurants, householders, and other consumers will be assured of an adequate supply of potable water. The public should be advised of measures which can be used during extreme emergencies to provide themselves with small amounts of safe drinking water, but reliance should not be placed upon the householders' efforts if it is at all possible to make other arrangements. Adherence to current standard methods of water purification will negate in large part any threat of contamination with biological warfare or chemical warfare agents introduced in advance of the purification process. Special, but not insurmountable, problems will be posed by the introduction of these agents beyond the purification plant. The only present protection is either the maintenance of a high residual chlorine in the water or the introduction of chemical neutralizing agents.

#### *Sewage*

Sewage collection and sewage disposal is not as serious a civil defense problem as might at first be imagined. It is possible that radioactive materials may be carried into the sewer lines and concentrated at the sewage plant, but this is, of course, of concern primarily to sewer works operators and maintenance crews. The disruption of treatment and disposal processes is not likely to produce significant health hazards.

The principal problem will be to prevent the contamination of water and food supplies with sewage from damaged sewers. Such contamination, however, may be prevented by such measures as pumping, temporary diversion, and improvised repair. In general, the repair of water systems would take priority over the repair of sewage systems, particularly of sewage treatment plants.

#### *Garbage and Refuse*

Normal collection services may be abandoned during emergency periods, and collection equipment diverted to more urgent duties. To prevent the development of insect breeding and other nuisances, community refuse handling agencies and health departments must plan to maintain certain minimum services: collection of dead animals and highly putrescible refuse;

designation of places for emergency storage (such as vacant lots or bombed-out buildings), with provision for the control of insects, rodents, and odors; and activation of emergency landfill disposal sites to supplement or replace normal disposal facilities. These measures are particularly important in the vicinity of emergency mass-feeding centers. Householders will need to know how to store or dispose of their own refuse until temporary storage points are established or until normal services are resumed.

#### *Food Sanitation*

The civil defense problem in food sanitation is to adapt the normal services of the health department and of the food industry to the dangers which will exist in an emergency. A particularly important task will be the supervision of food preparation at mass-feeding centers. Other tasks include evaluating possible contamination of food supplies by sewage, broken glass, biological, chemical, and radiological agents, and other extraordinary contaminants; implementing arrangements for decontaminating, segregating, or destroying such supplies; and arranging for the orderly opening and closing of restaurants and other public eating establishments in accordance with civil defense emergency feeding needs. Routine inspection for contamination with biological and chemical agents of all foods being used, however, is not considered feasible.

#### *Insect and Rodent Control*

Normal control of insects and rodents is usually accomplished by mobile teams of specialists working for health departments, community mosquito control agencies, or commercial rodent and pest control operators, but only a few persons and a limited amount of equipment are involved. The civil defense job is to organize these limited facilities so that they may be readily deployed wherever they may be needed, and to train assisting personnel recruited from outside the vector control field.

#### *Household Sanitation*

Household sanitation will be crucial during any civil defense emergency, for it must be expected that many of the sanitation services

which are now taken for granted will be disrupted. One of the most serious problems will be the disposal of excreta in the event of water supply or sewerage failure, particularly for apartment dwellers and others not having access to backyard burial facilities. Two types of containers have been suggested. One is a watertight vessel for the direct collection of all human excreta. The other is a small combustible permeable container which will allow the urine to filter out, thus reducing the volume to be stored and collected. A suitable permeable container is not currently available.

#### *Emergency Lodging*

The sanitation problems of emergency lodging are essentially those discussed previously, that is, water supply, refuse disposal, toilet facilities, and the like. In addition, health authorities must establish criteria on space allocation, ventilation, lighting, and safety precautions at entries and exits.

#### *Epidemic Intelligence*

Early detection and identification of illnesses which may result from covert or overt attack with biological or chemical agents and early clarification of the methods of dissemination are extremely important in minimizing the effects of attack and alerting for future covert attacks. The principal problem will probably be in the field of biological warfare, for the victims of modern chemical warfare agents should be readily recognized. Epidemic intelligence may provide the first clue that a covert biological warfare attack has taken place.

Local health departments ordinarily investigate unusual outbreaks of disease, encourage prompt reporting of infectious diseases by physicians and hospitals, and provide laboratory services for the identification of infectious agents. All these services will be necessary for epidemic intelligence; therefore, integration of the normal peacetime functions of health departments with civil defense activities is essential. Mobile epidemiological teams may be needed to assist local health departments in carrying out epidemic intelligence activities during an emergency.

Another important aspect of epidemic intelligence is the need for emergency research dur-

ing and immediately after any overt attack so that the nature and effectiveness of the weapons used and the effectiveness of the civil defense countermeasures can be evaluated. Such evaluations may aid in saving lives in future attack. Specific, scientific teams should be assigned to obtain the necessary data.

#### *Laboratory Services*

The many laboratories in local, State, and Federal public health agencies; in medical, dental, veterinary, and other teaching institutions; and in private and commercial organizations can provide the laboratory services needed during an emergency for the preservation and restoration of normal sanitation activities, for the identification of biological warfare agents, and in some instances for the preparation of immunizing materials. Clinical laboratory services for the treatment of hospitalized and nonhospitalized patients are present in most hospitals, but these will have to be expanded greatly to deal with the large numbers of casualties expected from an overt attack. The personnel in these laboratories are, of course, familiar with basic laboratory procedures, but it is essential that special training be given in the use of instruments and techniques for dealing with the chemical agents and exotic organism that may be used. Such training is necessary not only for existing personnel but also for the many auxiliary workers who will be needed.

#### *Prophylactic Services*

Atomic disaster would increase the spread of natural communicable diseases because of the disruption of sanitation services and the inevitable crowding of people under relatively poor hygienic conditions. If biological warfare agents should also be used, the dangers of disease spread would be further increased.

The National Research Council has recommended that all persons, adults and children alike, be immunized against tetanus because of the danger of infection following burns and other injuries. The Association of State and Territorial Health Officers, because of the practical difficulties involved in such a program, prefers instead to promote the immunization of children.

The practical limitations of any immunization program at this time are recognized, but it is suggested that the immunization of children against diphtheria and whooping cough and of both children and adults against tetanus and smallpox be encouraged and that substantial quantities of these immunizing agents be stockpiled against a future emergency. These stockpiles will be needed in the event of an actual attack and might be used even before an attack if the situation becomes so critical that people become convinced of the necessity for such immunizations.

#### **Suggestions for Action**

A few suggestions for action to meet some of the public health problems have been given in connection with the discussion of these items. There remain several broad recommendations affecting both public health and medical care problems which deserve special emphasis.

#### *Local Casualty Estimates*

In estimating the number of casualties, most of the local civil defense health service planning has been concerned with the physical casualties following atomic attack. Little consideration has been given to possible casualties from bacteriological and chemical warfare agents and to psychiatric casualties from any type of attack. It is believed that metropolitan area civil defense personnel should make estimates of such casualties on the basis of local and other information. It is suggested that estimates of psychiatric casualties from a sudden catastrophic attack might be predicated on a rate of approximately 1 such casualty for each 4 to 6 physical casualties.

#### *Strengthening Local Services*

Most local civil defense health organizations are not now ready to deal effectively with a major enemy attack directly involving the civilian population, although, of course, some are better prepared than others. Many programs are lagging seriously because of a lack of personnel with medical administrative experience who can devote full time to recruiting, organizing, and training a "hard core" of regular civil defense health workers.



The civil defense health service should be developed according to a phased schedule, involving motivation, planning, development of organization, and recruiting and training of leaders and workers. Emphasis at the present time should be on the development of a "hard core" of regular civil defense health workers rather than on the recruiting of millions of volunteers. School buildings and other structures should be earmarked for possible use as temporary hospitals and first-aid stations. Ocean-going, lake, and river vessels should also be considered as possible temporary hospitals. Health departments, particularly in urban areas, should bring their epidemic intelligence services to a high degree of proficiency.

#### *Mobile Support*

A marked disparity will undoubtedly exist between the number of trained personnel and physical facilities needed to provide even minimal civil defense health services and the number available, even if all present and projected health resources are available after an attack. Furthermore, an atomic attack could destroy most of the health personnel and facilities in the target area, and biological or chemical attack on an unprepared population could destroy or incapacitate most of the health personnel even though the facilities may be spared. *Thus, people in target areas surviving such attacks may have to rely almost exclusively on medical aid from outside the target areas.*

Local hospitals and health organizations have done very little planning for the utilization of outside aid, though many of them have given considerable attention to the vital first step of self-help. Accordingly, it is believed that local, State, regional, and Federal civil defense health planners should give increased emphasis to plans for mobile support by medical and public health personnel and for the use of medical facilities at a distance from target areas. The validity of such plans must be assessed by regional test exercises.

#### *Rehabilitation Policies*

The development of sound emergency health service plans could be accelerated by establishing national policy on such questions as the extent to which individual and community med-

ical rehabilitation is to be carried out or financed by Federal, State, and local official and voluntary agencies; the relation of medical rehabilitation to other rehabilitation activities; the nature of war risk insurance, if any. Health services which make optimum provision for the smooth transition from short-term emergency actions to long-term rehabilitation activities and which assure continuity of care for the injured depends on clarifying these problems.

#### *Utilization of Health Manpower*

Much remains to be done to assure maximum effectiveness in the use of the critically short supply of professional and subprofessional health personnel in all categories. The majority of treatment activities, short of surgery, will have to be carried out by technical aids under professional supervision. Therefore, careful study of medical, nursing, and other health functions necessary during an emergency should be made to determine which of the activities usually performed by professional and subprofessional personnel can be delegated to less highly trained volunteers working under competent supervision.

#### **Basic Principles**

The purposes of civil defense health services are (a) to minimize the extent and severity of, and provide treatment for, civilian casualties caused by enemy action and (b) to maintain the health of, and provide emergency noncasualty medical service for, evacuees and other individuals deprived of their usual medical care resources.

It is imperative, however, that the normal patient-doctor relationship be reestablished at the earliest possible moment after a disaster so that the current structure for providing health services be affected as little as possible. The established patterns and long-range trends in the provision of health services should not be modified unduly by the necessity to provide emergency mass treatment. It is also imperative that continuity of medical care be maintained for each casualty during the transition between the health emergency and rehabilitation phases.



These basic principles can best be applied by utilizing to the fullest extent possible existing civilian health services in providing emergency health services.

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### Process for Extracting Andromedotoxin

Andromedotoxin, a pure compound with therapeutic possibilities in the treatment of hypertension, has been isolated from rhododendron leaves by a modified extraction process developed by two research groups of the National Heart Institute of the Public Health Service. The chemical structure of the drug is still unknown. Not a cure for hypertension, the compound may be useful in lowering the blood pressure in certain cases of hypertension. The compound has not been tested clinically, but trials at Emory University School of Medicine have demonstrated that it temporarily lowers blood pressure in animals. In low doses, it has a strong but brief hypotensive effect.

Special methods for extracting the material, precipitation procedures for eliminating unwanted substances, and chemical steps for purifying the compound by selective absorption were developed by the researchers.

To isolate andromedotoxin, fresh leaves of the native North America species *Rhododendron maximum* were first chopped, then boiled for an hour, and strained. In appearance, the brew changes during the extraction process from a substance resembling strong black coffee to one with the consistency of new-fallen snow. Of special interest to pharmacologists, the clumpy substance resembles the veratrum alkaloids in physiological actions, but unlike alkaloids, it contains no nitrogen.

More than 1,000 pounds of rhododendron leaves were required to make 1 ounce of the drug. They were collected by the United States Department of Agriculture in North Carolina and West Virginia. The isolation procedures were conducted at the Institute and the pharmacological work was done at Emory. Dr. Neil C. Moran reported on the research at the annual meeting of the American Society for Pharmacology and Experimental Therapeutics at New Haven, Conn., September 7, 1953.

# Water, Sewage, and Industrial Waste Research Trends and Needs

By ALFRED H. WIETERS, M.S., and LEONARD B. DWORSKY, B.S.

**A**LTHOUGH the problems of sanitation are as old as man, scientific research in the water and sewage field is relatively new. It is a field in which the States have historically taken a leading part. The establishment of the Lawrence Experiment Station as a part of the Massachusetts Health Department in 1886 marked the beginning of the science of sewage disposal in the United States. Since those early days, similar experimental work has been undertaken by many of the other States.

It is appropriate that the States should continue to have a major role in this field. They have the knowledge of the factors in their own

environments—climate, health, natural resources, economic conditions, industrial and other relationships—that is necessary for the most effective research on problems relating to their own individual concerns. In addition the States are the best laboratories for trying and testing new sanitation developments, prior to adoption on a broader or even national scale.

## Volume of Research

A complete listing of current research projects is not available. However, on the basis of information assembled from several sources (1-3), it appears that between 150 and 200 projects currently in progress in the States directly concern water supply, sewage treatment, and pollution control and about 100 additional projects deal specifically with industrial waste. Most of these are being conducted by college and university laboratories, and the rest by State organizations, technical associations, or private research institutions. Some of the projects are being supported in part by Federal grants, principally from the Public Health Service and the Atomic Energy Commission, with a few from the United States Bureau of Mines, United States Geological Survey, United States Army, and others. Many additional investigations on industrial wastes are, of course, being conducted by individual industries.

Even on the basis of admittedly incomplete

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*Mr. Wieters, since 1948 assistant chief of the Division of Water Pollution Control of the Public Health Service, was director of the division of sanitary engineering of the Iowa State Health Department from 1926 to 1946. Mr. Dworsky was a sanitary engineer with the Illinois Department of Public Health and Cook County Department of Public Health from 1936 to 1941. After service in the Army Sanitary Corps, 1941-46, he came to the Public Health Service and since 1948 has been with the Division of Water Pollution Control as chief, reports and education branch.*

*This paper is based on material presented by Mr. Wieters before the Texas Water and Sewage Research Foundation at Austin on November 10, 1952.*

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information, it is apparent that in more than three-fourths of the States some research activity is under way in either the water and sewage or the industrial waste field. The extent of this activity ranges from 1 project to more than 25 separate studies in a single State.

The Federal Government has been an important factor in certain broad areas of research, either by conducting investigations in its own laboratories or by contributing largely to their support in the facilities of universities, States, industries, or private institutions. Such studies include those related to military developments and electronics; those concerned with the public domain, mineral resources, agriculture; a considerable part of health research; and other broadly based, long-term investigations in the purely theoretical area. The advances in fundamental knowledge stemming from basic research makes possible the applied and developmental progress in problem areas.

#### **Public Health Research**

In the public health field, systematic and continued scientific investigation as a recognized function of the Public Health Service began at the turn of the century, although some research was conducted as early as 1891 in the somewhat makeshift facilities of the Hygienic Laboratory. In 1901 Congress provided for the erection of a laboratory "for the investigation of infectious and contagious diseases and matters pertaining to the public health," and a division of scientific research was organized in the Service.

From the very beginning, attention was given to the relation of stream pollution to disease. It was not until 1910, however, that there was an organized, large-scale investigation in this field. At that time a study was made in the Great Lakes region of the relation of polluted water supplies to typhoid fever. This study was followed in 1912 by a pollution survey of the Missouri River. A short time later several temporary laboratories were established for field investigations, one of them at Cincinnati, and work on a plan for comprehensive stream pollution investigations was begun (4).

The Cincinnati laboratory, now the Environmental Health Center, has since been the focus for the Service's environmental research. Consistently, through the years, the investigations of the center have been those having general, rather than local, application, and those requiring the kind of continuous or extensive studies not likely to be undertaken by private agencies, or by State and municipal organizations.

Work currently in progress in water pollution and related areas includes development and evaluation of analytical techniques for both organic and inorganic materials; studies of persistence of particular organic compounds in water; application of biological oxidation processes to waste purification; studies of industrial waste sources, characteristics, and corrective measures; inventory surveys on pollution of water resources; development of biological methods for determining the severity and extent of pollution; studies of toxicity of water pollutants to aquatic life; development of bioassay methods and their application to pollution control; development of methods for control of organisms responsible for tastes and odors in water supplies; and studies of pollution and purification of shellfish in aquatic environments. Time and time again, these studies have resulted in significant developments that are now being widely used.

#### **The Need for Basic Research**

The importance of basic research to the Nation's security and continued prosperity was emphasized by experience during both World Wars. Since the turn of the century, the country has made rapid and continuous technological progress, advancing from an agricultural Nation to a highly industrialized world power. In many fields, however, technological developments were based principally on the basic and fundamental discoveries of the scientists of other nations, and our contribution was mainly applied and developmental. When the free flow of scientific information from Europe was cut off, we faced a serious deficiency in facilities and capacity for basic research.

Recognition of the inadequacy of this country's research programs led the President, in 1946, to appoint a Scientific Research Board to



review the current national situation and recommend a course of action which would insure that the scientific personnel, training, and research facilities of the Nation would be used most effectively in the national interest.

The board's report in 1947 indicated that the Nation was then spending \$1.1 billion annually for research. Only about 10 percent of that amount was for basic research. The board recommended that by 1957 the annual rate of total research expenditures be doubled, of health research, tripled, and of basic research, quadrupled. It further recommended the establishment of a National Science Foundation to establish research policy for the Nation and to administer Federal grants in support of basic research.

Such a foundation was established by the Congress on May 10, 1950. Subsequently, the foundation has reported that in 1951 the Nation spent an estimated \$2.5 billion for research and development (5), and in 1952, about \$3 billion (6). A preliminary report issued jointly by the Departments of Defense and Labor set the 1952 national outlay for scientific research and development at more than \$3.5 billion (7). Thus the Scientific Research Board's 1957 goal for total research has already been reached and passed. The unexpectedly rapid acceleration was due in part, of course, to the great increase in projects having military significance, stimulated by the defense buildup. A contributing factor has also been industry's growing awareness of the important role of research in expanding productivity and markets. To an increasing degree, industries are devoting substantial portions of their budgets to research and product development, such expenditures amounting in 1951 to \$1.2 billion. In view of the high returns now recognized as resulting from these outlays, the trend toward greater emphasis on industrial research is expected to continue (8). The cost of research conducted by the industries included in the Defense-Labor survey referred to above was reported as 2 percent of sales.

#### Health Research

Although the rate of increase in health research expenditures has been considerably less than that for total research expenditures, prog-

ress has been made toward the 1957 goal of \$300 million recommended by the Scientific Research Board. The latest published estimates indicate a total of \$181.2 million for 1951, an increase of about 60 percent over the \$115 million reported by the board in 1947 (9). The national totals for health research expenditures have not been broken down into subcategories which would permit a similar determination of the increase in water and sewage research. A committee exploring research needs in the somewhat broader area of environmental health reported in 1952 that it roughly estimated 1951 expenditures for research in that field at less than 10 percent of total health research (10).

An analysis of Public Health Service research expenditures (slightly less than 20 percent of the national total for health research), while not entirely representative of the overall situation, is meaningful. In 1952, about 2 percent of the total funds expended under Public Health Service research grants, and something less than 5 percent of the funds expended for direct research by Public Health Service staff, were allotted to projects in the environmental health field. These included, in addition to projects related to water treatment, water quality control, and water pollution, those covering various aspects of occupational health, air pollution, milk and food sanitation, radiological health, and such. In the 5-year period from 1948 through 1952, the number of environmental health grants increased about 40 percent and the amount of expenditures for such projects about 30 percent, as compared with increases of about 85 percent and 90 percent, respectively, in total public health research grants.

The report of a recent survey limited to projects dealing with treatment and disposal of sewage and industrial wastes and water pollution indicates that in the decade 1943 to 1953 the number of such projects increased from 128 to 148, about 16 percent. However the 1953 survey covered only the member institutions of the Engineering College Research Council, leaving for a later survey the projects being conducted directly by State health departments, interstate and intrastate agencies, industries, equipment manufacturers, municipal plants, trade associations, and others (3). Undoubt-



edly inclusion of those projects would materially raise the percentage of increase for the 10-year period, although it must be assumed, from the report of the earlier survey, that it, too, was incomplete.

### Industrial Wastes

With respect to the problem of pollution caused by industrial wastes, specific responsibility rests upon the particular industries and plants that create the wastes. The Water Pollution Control Act (11) does, however, authorize the Service to support and aid research to devise and perfect methods of treatment of industrial wastes, and otherwise to help in solving the problem.

Industry has undertaken a considerable amount of research, over the years, looking toward the solution of specific industrial waste problems. Recognizing the need for concerted action, several branches of industry volunteered early in 1950 to form a national committee as a means of appraising and coordinating the work under way, promoting further research and development, and stimulating the adoption of known practical pollution abatement methods by all segments of industry. The National Technical Task Committee on Industrial Wastes, representing 36 major industrial categories, was organized in May of that year at the invitation of the Surgeon General.

The Service works closely with the committee, providing technical and consultative assistance and serving as a clearing house for the interchange of technical information. As one phase of this cooperative work, the Service has compiled and maintains on punch cards an up-to-date inventory of industrial waste treatment methods, problems, and current and planned research projects. The initial information for this inventory was provided by the member industries of the committee, which supply additional items as they develop, and has been supplemented by abstracts of pertinent articles and reports appearing in technical journals. The assembled information is made available to the committee through distribution of sets of the punch cards to each member.

Obviously, the coordinated research and pooling of information available from this

group, representing practically the entire industrial organization of the country, is of tremendous value.

### Future Research Needs

The foregoing background is presented for the consideration of future research needs in the water, sewage, and industrial wastes fields. In determining specific research areas that most critically need attention, both now and in the future, special consideration must be given to the impact on water and sewage problems of such factors as: the expansion of industry; the development of new products; the depletion of our natural resources; the growth of population; increased urbanization; rising standards of living; increases in water requirements; increase in volume of wastes; the broadening concept of water resources development.

### *Industrial Developments*

Perhaps the greatest number and variety of problems stem from expanding industry. Since 1900, production has increased more than seven times. Over half of that increase has taken place in the past decade. The President's Materials Policy Commission predicts that between 1950 and 1975 there will be another 100 percent increase (12). As the growing industrial machine has consumed raw materials at faster and faster rates, the threat of depletion of the less plentiful natural resources has furnished incentive for the development of many new materials from the abundant supplies of coal, air, and water—materials such as plastics, synthetic fibers, insecticides, and weedkillers. Production of these materials is adding quantities of wastes to our streams. As yet, there is no basis for even estimating what the volume of these wastes will be. The Materials Policy Commission reports that it is impossible to project production of those new materials as for established products, since these recent and continually growing industries have not yet found their stable place in the economy. Tentative estimates indicate that the production of synthetic fibers, such as nylon, orlon, and dacron, will increase from slightly more than 150 million pounds in 1950 to about 4 billion pounds in 1975; production of insecticides is expected to

double and of weedkillers to triple in that period; 1975 production of plastics is estimated at 9 billion pounds as compared with 2.28 billion in 1950; detergents may increase from 1.66 million pounds to possibly 4 billion by 1975 (13, 14).

In addition to the problem of manufacturing wastes, there is, for some of these products, the question of the effects their use will have on the basic elements of our environment. What will they do to the air and to the water when they are washed into the streams? For example, we do not yet know the extent to which present public water supply treatment methods will be effective against the chemicals now being placed in our streams as a result of use of new insecticides and weedkillers. The recent rapid development of chemical-producing industries in concentrated areas, as for example, along the east coast of Texas, has created air pollution and other difficulties that must be speedily overcome if the benefits of such growth are to outweigh the penalties.

The chemical industry as a whole is progressive, forward-looking, and conscious of its responsibilities to the communities in which it operates. It has spent large sums of money on research and equipment for preventing pollution of both air and water and there is good reason to expect that, as new problems arise, answers will be found.

Other industries, too, are becoming increasingly aware of the need for conserving water quality in order to insure an adequate future supply for their needs. They are also becoming more conscious of their public responsibility for disposing of the wastes they create in such a way that they will not damage these resources.

#### *Population Growth*

This country's population has doubled during the past half century. Current estimates indicate that by 1975 it will approach the 200 million mark. Along with this growth, there has been a continued trend toward concentration of population in urban centers. Sixty-five percent of the population is now urban, 35 percent rural. This trend can be expected to continue and the problems are expected to intensify as the Nation's industrial machine expands.

The problem of disposal or utilization of the

added volumes of both industrial and municipal wastes is in itself a staggering one. When the demands that will be made upon our water resources in the years immediately ahead are considered it is clear that the Nation cannot afford the inevitable reduction in usable water supplies that would result from discharge of these wastes, untreated, into the streams. The Nation's water requirements in 1975 are expected to be 90 percent greater than in 1950—almost double. Industry's needs alone may increase 170 percent, from 80 billion gallons per day to 215 billion gallons. Municipal and rural needs should increase 50 percent, partly due to increased population and partly to intensified use of modern appliances requiring water for operation—dishwashers, garbage disposals, automatic laundry equipment, and air conditioning.

These estimates are an indication of what the future will demand. The fact that there are many areas, even now, where the problem of adequate water supplies is becoming critical is forewarning that solutions must be found while there is yet time.

#### **Most Needed Areas of Research**

There are several areas of research that are obviously of major and primary importance.

*New techniques must be developed for determining the amounts and kinds of pollution present in the streams, and the effects of such pollution on the receiving waters.* With present analytical methods it is necessary to be satisfied with something less than the best determinations on the growing volume of wastes, many of which are the products of raw materials and processes that are outside our present experience.

*Better yardsticks must be established for water quality objectives.* Until more precise quality requirements are agreed upon for each of the various water uses—bathing water quality, irrigation, livestock, public water supply, industrial, and the others—we are restricted in our ability to determine which of those uses are attainable in each of the individual river basin areas and can thus be adopted as goals in developing comprehensive water pollution control programs.

*Cheaper sewage treatment methods must be developed.* There have been relatively few basic changes in sewage treatment methods over the years, although some attempts have been made to perfect and refine them. While the methods in use have been reasonably effective, there is an obligation to the public to reduce the cost of this public service if it is possible to do so. Scientific knowledge has made great advances since the present treatment methods were developed. Some of those advances should provide the basic principles from which could be developed better, quicker, and cheaper sewage treatment processes.

*Methods for treating new types of industrial wastes must be developed.* As stated earlier, this is basically the responsibility of industry itself. Those who develop the new manufacturing processes and products are the ones best fitted to solve the waste problems accompanying such development. For that task principal reliance must be placed on industry itself. Industry is best equipped also to look beyond the wastes and investigate the prospects of utilization, either by reclaiming raw materials or by developing byproducts.

Persons trained for this work are in short supply. The Nation is not producing enough technical personnel to satisfy its growing requirements. A solution to the problem of conserving and making full use not only of trained personnel but of laboratory facilities may be found in the more extensive use of regional, nonprofit, independent research organizations. Such agencies can provide corps of trained researchers who can give service to State governments, to industry, and to others interested in sponsoring investigations in various fields. They are able to undertake jointly sponsored research leading to the solution of many of the common problems that face industries and local governments in areas where rapid development is taking place. They can act as a clearing house for new scientific information in such areas.

A recent summary of 1950-53 growth of 7 independent research organizations (which together account for more than 1 percent of the Nation's total research outlay) gives evidence of the increasing use being made of this type of organization. Collectively these 7 regional

centers have doubled their business volume in less than 4 years (15).

*There is need for integration and coordination of research studies and findings.* Research organizations and workers must be constantly aware of studies under way in other areas that might produce results affecting their own investigations. As an illustration, consider the work in progress on removal of salt from sea water in order to open up new water supply sources. Thus far, no economically feasible method has been perfected, but the project has progressed beyond the merely theoretical stage. In a law passed in 1952 (16), the Department of the Interior was directed to further pursue the investigations. Excessive processing cost is an important hurdle in attaining the objective. Closely allied studies are concerned with the extraction of usable minerals from the ocean. In the search for new sources of rare materials, attention has turned to sea water, sea life, and the ocean bottom. Practical methods have already been found for extracting some of the wealth that we now know the ocean holds. For example, bromine and magnesium are being economically recovered from sea water. The development of economical recovery techniques will add many others. All of these endeavors will move more rapidly if the researchers in each field keep informed of developments in the others. Every usable material that can be added to the list of those obtainable from the sea, every feasible combination of processes for their extraction, will lessen the cost for each and bring closer the possibility of economical operation.

*Multiple-purpose use.* We need to project our vision beyond its horizons, which perhaps have been too limited by our concentration over the years on the narrowly defined public health aspects of water and the relation of waste treatment to public health per se. We need to have a deeper appreciation of the multiple-purpose concept of water use, and to apply that concept to our work. From a long-term view, this is a relatively new concept. It has been an outgrowth of basic legislation developed over the past half century—the Reclamation Act of 1902; the Tennessee Valley Authority Act, adopted in 1933; the Flood Control Law of 1936; the Water Pollution Control Act of 1948.



This kind of development of our water resources was foreseen by Theodore Roosevelt when he wrote (17):

Every stream should be used to its utmost. No stream can be so used unless such use is planned far in advance. When such plans are met, we shall find that, instead of interfering, one use can often be made to assist another. Each river system, from its headwaters in the forest to its mouth on the coast, is a single unit and should be treated as such.

Under this concept, the water problem takes on a new perspective. Programs encompass entire basins; all water uses—domestic, industrial, agricultural, recreational, fish and aquatic life, waste disposal—are factors in a total regional planning process rather than separate entities related only to a particular water or sewage plant. Under this concept our sights are raised past the boundaries of the communities which those plants serve.

In actual practice, the States are attaining this broadened perspective through the increasing use of regional councils and interstate compact groups for joint consideration and solution of their common water problems.

As plans are developed on broad basin areas, the water needs of industry, of the population, of agriculture, and of other users must be compared. The benefits from those uses must be weighed. The possible advantages of changing existing priorities—as between industrial, agricultural, and other uses—must be given careful consideration. If the full benefits of river basin development are to be realized, water quality must be conserved.

*Adequate basic information* is essential to meet the growing need for developing the Nation's water resources in a way that will best serve all the people. We need more rainfall and stream flow records, particularly low flow records; we need additional data on the physical, chemical, and bacteriological characteristics of the raw water in our streams. We need up-to-date facts on the economics behind the various water uses.

*Development of better procedures for assuring that research findings are utilized is an*

*urgency.* Too often, the active interest of those who have completed a research study ends with their report of findings. There should be an additional step in the research process, a following-through by those actually producing the findings, to assure that new knowledge is channeled to those who need it. This requires the development of closer relationships between those engaged in research of a physical nature and those working in the social and political science fields. In the area of research dealing with water and sewage, for example, there should be cooperation with agencies such as the bureaus of governmental research in universities, and the organizations providing service to governmental agencies—the International Association of City Managers, the Council of State Governments, and the like. The use of periodicals in the political science, social science, and economic fields, in addition to those in the sanitary engineering and public health fields, as a means of communicating certain kinds of research findings might aid in the development of such relationships.

Careful interpretation of findings and their presentation in a way that will permit their most effective use at the operating levels are also important elements in this followup procedure. The important point is that in order to get the maximum value from research expenditures, we must not only take responsibility for actually doing research, but must also make certain that the knowledge provided by research reaches those who can make effective use of it.

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## Dr. Meister Wins 1954 Chemistry Award

Dr. Alton Meister, head of the clinical biochemical research section, laboratory of biochemistry at the National Cancer Institute, was selected to receive the 1954 Paul-Lewis Laboratories award in enzyme chemistry. The award, consisting of a gold medal and \$1,000, is given each year by the American Chemical Society to the outstanding American enzyme chemist under the age of 40.

Dr. Meister, who is 31, won the award for discovering the mechanisms by which normal tissues and cancer tissues cause the exchange of chemical groups between amino acids and the breakdown products of sugar and for discovering that vitamin B<sub>6</sub> is necessary in this exchange. Glutamine, an important compound present in almost all tissues, was found to be the key substance in many of these reactions. In the course of his experiments, a number of new compounds called "keto acids" were isolated in crystalline form for the first time, and the way in which the body converts them into amino acids was determined. These studies may be helpful in explaining the growth processes of cancer cells.

Previous Paul-Lewis awards were won in 1953, 1952, and 1951 by Drs. Earl R. Stadtman, Bernard L. Horecker, and Arthur Kornberg, all of the National Institutes of Health, Public Health Service, Bethesda, Md.

# Environmental Health in a Rural Economy

By MARK D. HOLLIS, C.E.

PROGRESS in environmental health in rural areas has lagged behind improvements in urban living. Rural sanitation, though it has advanced considerably in recent years, has lagged behind other forms of material progress even in rural areas, and, in certain respects, the rural environment in the past 10 years has deteriorated. Such deterioration is observed not only in the lack of maintenance of originally satisfactory installations, it is found also in new installations in fringe urban areas where, for example, septic tanks have been employed under unsuitable conditions.

Public health in the city is affected by rural health. The food of the population as a whole depends on the productive efforts of a small rural minority (1). In view of its economic importance and in view of the tendency of rural youth to move to cities, the rural population's health should be at least as good as the health of urban dwellers. There is a prospect that the productive powers of the rural population must be increased by all means possible to feed a growing population (2). Moreover, in an age of automobiles and planes, the communication of disease between rural and urban areas is swift: it is folly to expose any part of

the population unnecessarily to channels of infection (3). The lack of rural sanitation imperils not only the country dweller but also the many millions from the city who visit rural recreational areas.

## Sanitation as an Investment

The speed and direction of change in our times has not spared the rural economy. In older agrarian societies where the life cycle seemed to repeat itself from season to season, traditional customs and techniques were seldom questioned. But modern technology has stepped up the tempo of every isolated farm and quiet hamlet. Rural life has grown so much more complex that it becomes necessary not only to meet present sanitation needs but also to prepare to meet needs of the future. At present, we think of the rural dwellers who come to the city. For the future, we may think of the possibility of a dispersion from cities to rural areas as a technique of civil defense (4).

The emphasis on economic factors in environmental health is prompted by knowledge that vital statistics have so much to do with earning a living (3). We work to produce the essentials of life which make it possible for us to work. At the same time, improvements in health do not necessarily increase productivity; nor does every economic gain necessarily contribute to health. The relation between health and economics is not simple. While it may be assumed generally that every investment in health is returned many times over to the economy, it is practical to ask how to invest money in health

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*Assistant Surgeon General Hollis, chief engineer of the Public Health Service, used the data in this paper in July 1953 in discussions with the WHO Expert Committee on Environmental Sanitation, in Geneva. This paper deals with conditions in the United States only.*

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so as to secure the greatest return per dollar. The value of the return itself must be gauged not only by morbidity statistics but also by statistics indicating a change in levels of consumption, productivity, and social welfare. To determine whether the gain from rural sanitation is worth the cost in each area is not to question whether it pays to save a life. The question is how, with available resources, investment in rural sanitation can secure a satisfactory return in the abundance and richness of human life.

### Rural Attitudes

About a third of the population is rural. A sixth of the Nation live on farms: these feed the lot of us and some abroad, too. About 30 million other rural Americans live in villages of less than 2,500 or in even more isolated circumstances. They include loggers, fishermen, trappers, miners, retired elders, and commuters. Half of the rural population lives in the south, where a fourth of the farm families are non-white. The total rural population exceeds 55 million.

Obviously, the needs of the rural population vary from house to house. Also, the operations to finance and administer sanitation programs for this population are bound to vary. The necessity for tailoring sanitation operations to peculiar local needs places the main responsibility upon local authorities, and often on the individual family.

Government is ordinarily held responsible for financing public health services in the city. This is not so in the country. Sanitation of food and premises is clearly a public problem in the village and in other rural centers such as the school, church, and grange or community hall. But in most rural areas in the United States, sanitation is ordinarily regarded as an individual or private concern, even though many individual rural families cannot finance sanitation by themselves. If there is the will to bring rural demands for environmental improvement into balance with the demand for cars and electricity, however, the economic devices that provide cars, telephones, and power are capable of financing pipes and drains as well.

In the city, the danger of contagion has created awareness of community responsibility. In rural areas, the danger of contagion is less apparent. It is recognized mainly in the enforcement of sanitation on dairy farms, in the effort to protect the safety of fluid milk produced for the urban market. Hygienic milk production is probably the heaviest single contribution of its kind to rural environmental health in the United States. Tests of village water supplies by State and county health departments may rank next.

### Factors in the Lag

Three major factors in the lag in rural sanitation are the relatively high cost of water and sewerage systems for isolated structures, the usual necessity to finance each installation individually at relatively high rates, and the absence in many rural areas of a strong public health authority. These factors have less force in the village than on the farm.

Isolation, an important factor in protecting the health of the rural family, especially the farm family, also imposes penalties, especially penalties of a social nature. For example, among farm families with an annual income of more than \$10,000, it is found that 1 in 8 lives without running water in the house, and 1 in 30 lives in a dilapidated dwelling. Presumably, in an urban environment, these same families, stimulated by the example of their neighbors, would be much more likely to occupy homes reflecting their economic status.

The great majority of farm families, however, are not usually in a position to finance environmental improvements even at modest interest rates. To relieve their situation, there must be a narrowing of the gap between costs and capacity to pay, as a consequence of higher earnings, technological progress, or favorable financial devices. Most nonfarm rural families are only slightly better off. Environmental health services may be contributory to economic gains in rural areas, but first there must be economic devices to improve the rural environment.

Such devices have in fact contributed to rural improvements, including lighting, refrigeration, cleaning, smokeless cooking, and



milk sterilization. According to the United States Department of Agriculture index, American farm living improved 25 percent from 1940 to 1945. The improvement was 37 percent in the southeast. This index grades living levels on the farm according to the value of its products and the presence of an automobile, electricity, and a telephone. All these factors are important in the economy and welfare of the farm. The important factor of water does not figure directly in the index, although health levels are affected by the simple availability of water. Both the living level and the productivity of the farm family depend on easy access to water for such purposes as washing, bathing, irrigation, cooling facilities, and a water-carriage disposal system.

### Health and Health Facilities

Much of the recent literature on rural health touches only lightly on the environment. There has been a tendency to assume that the books on rural sanitation were closed with the decline of interest in hookworm. Even malaria control in rural areas is regarded by a few as a closed chapter. It has been more fashionable to speak of rural health wholly in terms of clinics, physicians, and nurses. Important as personal health services are, however, they do not reduce the value to family health of running water in the house, safe shelter, proper waste disposal, and protection against vectors of disease. Such environmental factors, covered here in the comprehensive term "sanitation," can contribute directly to rural health and indirectly to rural personal health services. If rural areas gain in health and productivity through improved sanitation, they will be less in need of other health services, and they will also more readily obtain and afford the other services they should have—nurses, physicians, and clinics.

The more rural the area, the fewer the health personnel, services, and facilities are in proportion to the population. At present there are public health organizations in approximately 1,600 of the 3,071 counties in the Nation. Most of these provide some service to rural areas. The counties that are not organized for direct full-time health services hold less than a fourth of the national population, but these counties

are predominantly rural. They contain 30 percent of the national rural population.

Some explanation for the slow trend in farm sanitation may be found in the studies which determined that village residents suffer more enteric infections than farmers (5). These studies suggest that the need for sanitation is less urgent on the farm.

The negative trend in village sanitation is laid to the unplanned construction of new homes without regard to the needs for water or waste disposal. About 40 percent of the new homes built in recent years are served with septic tanks rather than with sewer lines (6). In addition to the burden of maintenance, such installations require a proper regard for the suitability of the soil, the water table, and the density of the population.

In the past, the rural environment has been considered more healthful than the city, an assumption which must be qualified today. Relative healthfulness of environment depends on what places and conditions are compared. Even on the fundamental issue of the quality of the atmosphere, many a rural dweller is more exposed to dust, fungi, or pollen than an urban dweller who works and sleeps in an atmosphere which is filtered, humidified, and cooled or warmed to order.

Although the romantic appeal of the rural environment is strong, it is tempered by epidemiology. In 1900, the registered death rate among farmers was only half the urban death rate (7). Since then, however, living conditions in the city have been improved, and there has been a strong movement of relatively healthy and vigorous young people from rural to urban residence. Consequently, the death rates registered in rural and urban areas today are about equal. Death rates for mothers and infants are higher in rural areas than in cities. As to the death rates from enteric diseases, these are associated with a lack of water-carriage sewage facilities, a lack that is common in rural areas. Recently, in one county, the death rate from dysentery and diarrhea was 169.3 per 100,000, in contrast with a national average of 5.9 (8). This range suggests how sanitation may affect rural health. Hookworm in certain rural areas is found in more than half the population. The simple availability of running water for

convenient washing of the person has a relation to health that is so obvious it is readily overlooked.

Sanitation in the broad sense applies to all facilities and practices that concern public health, and, for this reason, the records on accidental injury are pertinent. Opportunities for serious injury on farms seem greater than in cities; disabling conditions among farm workers are one and one-half times greater than among industrial workers. Accidents on farms kill 14,500 and injure an additional 1.3 million yearly (9). Although concern with accident prevention in rural areas has activated the United States Department of Agriculture, manufacturers of farm machinery, distributors of electrical power and equipment, farm youth organizations, the National Safety Council, and various rural educational leaders, the accident problem is not appreciably controlled. At the University of Michigan School of Public Health a comprehensive survey of accident experience among the population of Washtenaw County, conducted in 1951-52, revealed the home accident injury frequency of urban dwellers to be 5 per 100, as compared with 11 per 100 for rural dwellers.

#### Physical Sanitation Needs

It is difficult to appraise the educational and physical needs of rural sanitation. An inventory of health facilities prepared by the Public Health Service in 1947 estimated that rural physical sanitation needs included repairs to existing water supplies or development of new supplies, chiefly wells, for more than 6 million homes where facilities were either lacking or insanitary. More than 7 million homes required improved sewage disposal. In terms of the affected population, more than 27 million people in rural areas needed new or improved water supplies, and 33 million had unsatisfactory sewage disposal facilities. There was a measurable difference between rural and urban areas in the quality of the water supply.

In 1950, piped running water inside the home was available in 96.4 percent of urban dwellings and in 42.7 percent of farm dwellings. Piped water was running in 68 percent of the rural nonfarm dwellings. In round numbers,

#### Housing facilities

Condition	Percentages of occupied <sup>1</sup> dwelling units		
	Urban	Rural non-farm	Farm
Dilapidated <sup>2</sup> -----	6.5	13.4	19.5
No running water in or outside the home-----	1.7	28.6	54.6
Outside toilets-----	6.8	41.4	65.6
Structure more than 30 years old-----	46.4	39.0	53.4
Noncentral heat-----	35.9	67.9	80.7
Wood cookstove-----	2.4	15.4	38.7
Kerosene cookstove-----	4.8	11.6	8.9
No icebox or refrigerator-----	4.0	16.1	25.5
No kitchen sink-----	5.3	26.5	45.2

<sup>1</sup> 42.5 million occupied dwelling units.

<sup>2</sup> A dwelling unit is classified as dilapidated when it has serious deficiencies, is run down or neglected, or is of inadequate original construction, so that the dwelling unit does not provide adequate shelter or protection against the elements or it endangers the safety of the occupants. Dilapidated dwelling units are so classified because of deterioration, as evidenced by the presence of one or more critical deficiencies or a combination of minor deficiencies, or because of inadequate original construction, such that they should be torn down, extensively repaired, or rebuilt.

SOURCE: U. S. Department of Commerce Census of Housing, 1950.

piped water was lacking in 1.1 million urban dwellings, in 3.1 million rural nonfarm dwellings, and in 3.6 million farm dwellings.

Rural homes are more crowded than urban homes. In 1950, the percentage of dwellings with more than 1.5 persons per room was 10.2 on the farms, 8.6 in rural nonfarm dwellings, and 4.7 in urban dwellings. The relation of crowding to contact diseases, such as tuberculosis and pneumonia, has been revealed in many studies, including the National Health Survey of 1936.

Comparisons in housing facilities offer further grounds for reflection upon the differences between urban and rural health (see table). The heating and cooking facilities indicate the relative extent of fire hazards. Other hazards to safety are suggested by the degree of dilapidation and age. The icebox figures may have significance for nutrition and food poisoning.

And the nature of the water and toilet facilities may be indicators of the extent of enteric infections.

It seems apparent that rural health is poorer than it should be. Medical surveys have found the rural population relatively high in incidence of brucellosis, septic throat, enteric disorders, and insectborne disease (10).

### **The Rural Economy**

Rural life is being transformed by population growth, by decentralization of industry, by modern communications, and by a broadening desire for the security that is attached to a piece of land. The farm economy also has been transformed by a series of strong markets, advances in agrobiological, electrified communication and mechanization, and a high degree of specialization suitable to given locations and markets.

According to the 1950 census of agriculture, there are more than 5 million farms. This number includes cattle ranches, groves, dairies, greenhouses, apiaries, mushroom cellars, and cranberry bogs. Nearly a third of these farms are part-time or residential farms whose occupants do not contribute materially to commercial agriculture. More than two-thirds of the operators had other income amounting to more than receipts from farm produce sales.

Of the commercial farms, more than a fourth specialize in field crops. Less than one-seventh of the commercial farms are classified as "general" farms.

Crop specialization influences the size of farms, although the wealth and enterprise of the owner, the dictates of geography and climate, and such legal provisions as those in the homestead or reclamation laws are also factors in determining farm size. A wheat farm, for example, takes more acreage than a pecan grove. Although the average size of an American farm is 215 acres, nearly 3 farms in 5 (56 percent) are smaller than 100 acres; 2 in 5 (36.5 percent) are under 50 acres. Only 5.7 percent have more than 500 acres, and most of these are in 17 western States.

The foregoing figures merely hint at variable situations to be met in a rural sanitation program. The following facts may indicate how

conditions of tenure, income, wealth, and social status influence the opportunities for sanitation.

### **The Virtue of Ownership**

The amount of money invested in a farm, or its capital value, is bound to affect a banker's judgment as to the desirability of investing additional funds in sanitation. There is distinctly a heavier investment in farms operated by owners than in farms operated by tenants. According to the 1952 survey of consumer finances published by the Federal Reserve Board, 69 percent of the owner-operated farms were valued above \$10,000. The corresponding figure among farms operated by tenants, managers, or sharecroppers was 22 percent. At the other end of the scale, only 1 percent of the owner-operated farms but 59 percent of the non-owner-operated farms were valued below \$2,500. These valuations include land, buildings, machines, and inventory.

Although nearly 1.5 million farms in 1950 were operated by tenants or sharecroppers, the trend in American farming since 1930 has been away from tenancy and toward ownership. The percentage of farms operated by the owners has increased since 1930 from 56 to 72 in 1950. The percentage of dwellings occupied by owners in 1950 was 66 on farms and 63 in rural non-farm units. Quite a variety of farm credit programs have assisted tenants in becoming farm owners and have contributed to improvement of rural sanitation. However, the differences between sanitation facilities of owned and rented homes are less pronounced than differences related to farm value, income, location, or ethnic factors.

The relationship of tenure to dilapidation is obvious. Of 5,721,000 occupied rural farm dwellings reported in 1950, nearly 4 million were owner-occupied, and 2 million were rented. About a fourth of the tenant homes were dilapidated (see table). Most of these lacked running water. About 12 percent of the owner-occupied farm homes were dilapidated as compared with 17 percent for all occupied farm dwellings. Of the farm tenant homes in good condition, almost half were lacking in running water. Rented farm homes were more crowded than homes occupied by the owners.



## Capacity to Pay

Farm income is probably the best indicator of the capacity to pay for sanitation. In 1949, by prewar standards a prosperous year, 3 out of 5 farm families reported net cash income of less than \$2,000. The median farm income of \$1,730 contrasts with \$2,560 for the rural nonfarm family and \$3,430 for the urban family in that year, even though it does not include any allowance for noncash income in the form of food and shelter provided on the farm. The maximum net cash income on nearly a third of American farms in 1946, also a prosperous year, was less than \$750.

Even when off-farm income is combined with farm income, including noncash income, it appears that in 1946 two-thirds of the farms accounted for about 92 percent of the farm family income from all sources. Ten percent of the farm families obtained 40 percent of the total income. The capacity to pay for sanitation on an individual basis was most restricted among that third of the farm families which share only 8 percent of the farm income.

Of the farm families with incomes of less than \$1,000, according to Census Bureau calculations of 1950, almost one-third lived in dilapidated homes. Two-thirds of the non-dilapidated homes in this income group lacked running water, and more than nine-tenths of the dilapidated homes occupied by this group lacked running water. Conditions were only a little better in the group, almost as large, with incomes from \$1,000 to \$2,000. These families with incomes below \$2,000 compose the majority of the farm population. Even if it is assumed that the extent of poverty in rural areas has been overstated, as it may have been, the maximum net cash income of the less prosperous farmers provides no great surplus to invest in the costs and charges described below for environmental facilities.

## Ethnic Factors

Ethnic and social factors also have a bearing on the sanitation of rural dwellings. Such factors create particularly acute problems for a high proportion of nonwhite Americans, including native American tribes (11), and for

about a million migratory workers (12). The migrants' problem is particularly difficult because of their transient residence. They assume living expenses not ordinary in a settled community, and, because of temporary residence, they are unable to gain eligibility for local welfare and health services.

While housing generally has become less crowded in the period from 1940 to 1950, for the nonwhite farm population the number of persons per dwelling actually increased. More than 80 percent of the dwellings of the rural nonwhite population have outside toilets, and more than 40 percent lack running water. No toilets at all are found on the premises of 13.7 percent of the nonwhite farm population as compared to 6.4 percent for the white farm population. To report that sanitation in a given ethnic group is below average, however, does not suggest that the aspirations and potential achievements of this group may not be as high as any other.

## Sanitation Costs

Costs of sanitation, in terms of out-of-pocket charges, must be recalculated for each separate project. The following figures give merely a rough idea of their probable magnitude.

In 1947, the Public Health Service estimated per-capita costs for provision of community water facilities in towns of less than 1,000 would range from \$35 to \$58, and sewage disposal systems would cost a bit more than \$60 in such areas. The cost of installing needed minimum individual rural sanitation facilities, such as a privy and a hand pump on a shallow well, was estimated to range from less than \$10 for each member of the population in New England and on the Pacific Coast to more than \$20 in parts of the south, where the needs were greater and where the degree of urbanization was less.

A 1948 estimate of the cost of constructing a house sewer, septic tank, distribution box, and 100 to 200 feet of absorption trench for a rural sewage disposal system gave figures which ranged from \$110 in the southern United States to \$525 in the north. The level of construction costs today is somewhat higher. Estimates for cleaning such a system range from \$14 for the simplest of operations to \$300 for operations

involving, for example, taking up and replacing the tile distribution system.

Fifteen years ago, the sanitary pit privy cost roughly from \$20 to \$40 each in prewar dollars, the equivalent of from 50 to 100 man-hours. The greater part of the cost was for materials.

At present, a shallow well with a hand pump costs \$75 or more to install. A privy usually costs a similar amount. Three-fourths of the cost is for labor. The cost of a pump alone today ranges from \$4 for a simple manual pump to more than \$500 for a heavy duty power pump. Construction cost index numbers are roughly twice as high today as in 1938.

Costs of vector control have been calculated for specific projects. Malaria control in our southern States uses  $2\frac{1}{2}$  man-hours and more than a pound of insecticide per dwelling per season. Ordinarily, the cost of residual spraying works out to less than \$1 per capita in these States, with labor charges the major factor. Typhus control in urban or village areas uses two-thirds of a man-hour and about  $2\frac{1}{2}$  pounds of DDT dust per dwelling. Because of the appearance of resistant strains of insects, health departments cannot rely completely on chemical controls. Rat and fly control are directly associated with refuse disposal, but sanitary disposal of refuse in rural areas is laggard.

The economical approach to hookworm disease appears to require concentration on afflicted families, rather than a mass approach. At the same time, since a high iron and protein diet supports resistance to hookworm disease, mass economic improvement appears to be a means as well as an end in the process of hookworm control (13).

Costs of accident prevention, an important phase of sanitation, are not calculable on the basis of common experience, at present.

#### **Administrative Considerations**

Education also must be counted in the cost of sanitation. The economies of rural sanitation cannot be separated from the desires, needs, and interests of the people affected. Time and effort invested in helping the rural community to understand the need, purpose, and use of environmental health services also contribute

to the installation and maintenance of the necessary facilities. Too many installations go out of operation for lack of maintenance and repairs. Similarly, an installation may be wasted unless there is a parallel investment in developing local understanding and participation in an enduring sanitation program. Education is a major factor in the conquest of many rural hazards, both biological and physical.

In theory, a logical, orderly, and economical development of rural sanitation would begin with individual surveys to determine the environmental health needs of each rural home. These needs would be weighed against capacity to finance construction and installation.

In practice, the task of determining needs is handled more often by equipment and supply salesmen and the consumer than by health departments.

About the best that can be done by responsible health authorities or community leaders in this situation is to try to bring about a mutual understanding among the many parties interested in sanitary installations and services on both the buying and selling ends and to help them secure the required financial assistance. More and more, the businessmen themselves may develop systematic packaging and marketing of complete sanitary units for the rural household to improve random marketing of pumps, screens, concrete tanks, pipe, sinks, and tubs. The technical advice of health officials would contribute materially to this development.

The rural credit program as a whole has given less emphasis to sanitation than meets the need. Although the bulk of farm credit is provided by private lending institutions, several Federal agencies provide guaranties and other facilities for obtaining credit at moderate interest rates.

Credit for farm development, including sanitation, has been supported by the Federal Government since 1916. Several thousand units of low-rent public housing in rural areas have been built under credit supports provided by the United States Public Housing Administration. Loans and grants to improve private rural housing were authorized to the extent of \$19 million for administration in 1952 by the United States Department of Agriculture through the Farmers Home Administra-

tion. The funds were all committed within a few months. The Farmers Home Administration also issues loans to assist farm tenants to become farm owners, and it assists owners to develop farm property.

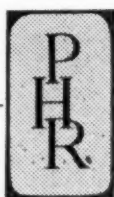
While these loans are not necessarily profitable, similar credit operations of the Department, through the Farm Credit Administration and the Rural Electrification Administration, have been self-supporting. Loans have always been available from REA for financing rural plumbing. And home construction loans by the Farmers Home Administration are issued under sanitary standards consistent with those recommended by public health agencies. If rural credit programs are assisted to a greater extent by the advice and resources of health authorities, it may be expected that rural sanitation and welfare will advance the more rapidly.

The experience of the Rural Electrification Administration suggests a time schedule that might be applied to rural sanitation. Electric power from a central station is provided on 90 percent of the farms in the United States. In 1935, only 10.9 percent of farms were so electrified, only 0.9 percent in the least developed States, and only 53.9 percent in the best. The percentage of electrified farms in each State today ranges from as high as 98.9 to no lower than 65. Judging by the pace of rural electrification, it should be possible to satisfy the bulk of environmental health needs in rural areas within a generation.

NOTE. Unless otherwise indicated, the economic statistical data are taken from tables published by the United States Department of Commerce, the United States Department of Agriculture, and the Federal Reserve Board. An extensive list of references on the general subject of rural health is available from the United States Department of Agriculture Library (Rural Health; Annotated list of selected references; Library list No. 60, 1953).

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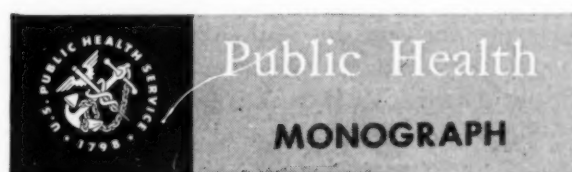
# *Services of Preventive Medicine*

## *To an Observed Population*

Public Health Monograph No. 16 contains data on personal preventive medical and related services for each member of a group of families canvassed monthly over a 5-year period, 1938-43, in the Eastern Health District of Baltimore. The services recorded were dental care, eye refractions, immunizations, complete physical examinations, and checkups following surgery or medical treatment or exposure to communicable disease.

Maximum dental cases and visits occur under 20 years of age but rates were high from 5 to 30 years of age. Rates for fillings, prophylaxis, and crowns and bridges, are highest under 20 years of age, and decline thereafter. Extractions and X-ray have their highest rates in middle life; plates, at 40 to 50 years of age. Except for the young and old ages, females have considerably more dental service at each age. Persons with higher incomes received more dental service than those with lower family incomes. Similarly, persons in professional-business-clerical occupations received more dental care than those in manual occupations. The proportion of dental care received in public clinics decreased rather regularly and considerably during the 5-year period.

Of all eye refractions, 47 percent were done by optometrists or opticians, 33 percent in clinics, and 20 percent by private physicians, of whom about two-thirds were eye physicians. The age curve for eye refractions shows two peaks, 10-14 and 45-54 years. At every age except the oldest, the refraction rates were definitely higher for females than for males. For females, refraction rates are highest in Sep-



### No. 16

The accompanying summary covers the principal findings presented in Public Health Monograph No. 16, published concurrently with this issue of Public Health Reports. The authors are with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and the major universities, and in selected public libraries.

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Collins, Selwyn D., and Phillips, F. Ruth:  
Dental, eye, and preventive medical services. Public Health Monograph No. 16 (Public Health Service Publication No. 290). 28 pages. Illustrations. U. S. Government Printing Office, Washington, 1953. Price 20 cents.

tember and February, but rates for males show little regular seasonal variation.

Well-baby and child care, complete examinations, and checkups are definitely more frequent in clinics than in private practice, 68 to 84 percent being done in public clinics. However, less than half of prenatal care and postpartum examinations were done by clinics. In the frequency of these examinations, all except those relating to pregnancy and the puerperium were highest under 20 years of age, and well-baby and child care was largely under 5 years with a peak at 1 year of age. Age-adjusted rates for complete examinations increased with income but the opposite was true of checkups. Age-specific rates for well-baby and child care, particularly under 5 years of age, decreased rapidly as income increased.

Smallpox, diphtheria, and whooping cough annual immunizations amounted to 106, 97, and 26, respectively, per 1,000 children under 10 years of age. During the 5 years of the study more than half of the first 2 immunizations were done in public clinics, but 99 percent of the whooping cough immunizations were done by private physicians. Diphtheria and whooping cough immunizations were done at the earliest ages, the peak rates occurring under 1 year of age followed by a rapid decline. Smallpox vaccinations occurred at roughly the same frequency in each single year of age under 5 years, with a moderate drop thereafter. Smallpox and diphtheria immunizations per 1,000 children under 5 years of age decreased regularly as the family income increased but the opposite was true for whooping cough.

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### 1,300 Projects Completed

To date 1,300 projects under the Hospital-Survey and Construction Program have been completed and put into operation. More than 700 projects are under construction, with 120 in preconstruction stages. Cost of all construction now totals more than \$1,700,000,000. Communities and States have supplied more than \$1 billion of this amount. The Federal Government's share is nearly \$600 million.

## Final 1952 Report On Tuberculosis Morbidity United States and Territories

A total of 109,837 tuberculosis cases was newly reported in the continental United States during 1952, according to final reports received from State health departments. This figure represents a decline of 7 percent from the total reported in 1951. Part of this decline is accounted for by changes in the types of cases reported.

This is the first year in which new tuberculosis cases reported have been classified as group A (active and probably active) and group B (arrested and other reportable cases), as recommended by the State directors of tuberculosis control at their 1951 meeting in Cincinnati (1). Although the types of cases reported as group B vary widely from State to State, those reported as group A are fairly uniform. Group A tuberculosis cases newly reported to State health departments during 1952 totaled 85,607—an annual rate of 55.0 per 100,000 population.

The number of active and probably active cases reported in 1952 for each of 6 States was estimated because of the incompleteness of classification, which had a bearing on the count of active cases. Some of these States, however, have since adopted new morbidity reporting procedures so that all States probably will provide information on the number of newly reported active and probably active tuberculosis cases during 1953.

The accompanying table gives the data from the States and Territories. The newly reported active and probably active tuberculosis cases per 100,000 population varied among the States from a high of 164.0 for Arizona to a low of 16.4 for Nebraska. The rates for Alaska and

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*This report was prepared by the Division of Chronic Disease and Tuberculosis, Public Health Service.*

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# New tuberculosis cases reported, United States and Territories, 1952

State or Territory	Total newly reported tuberculosis cases	Newly reported active and probably active (group A) tuberculosis cases		State or Territory	Total newly reported tuberculosis cases	Newly reported active and probably active (group A) tuberculosis cases	
		Number	Rate per 100,000 population <sup>1</sup>			Number	Rate per 100,000 population <sup>1</sup>
Alabama.....	2, 448	1, 375	45. 1	New Jersey.....	3, 769	2, 234	43. 8
Arizona.....	2, 865	1, 409	164. 0	New Mexico.....	1, 026	680	93. 8
Arkansas.....	1, 840	1, 481	78. 9	New York.....	11, 661	11, 386	75. 0
California.....	8, 232	8, 232	72. 3	North Carolina.....	2, 000	1, 565	37. 4
Colorado.....	1, 206	495	34. 6	North Dakota.....	206	206	34. 3
Connecticut.....	1, 317	935	44. 5	Ohio.....	7, 228	5, 124	62. 7
Delaware.....	245	149	44. 1	Oklahoma.....	1, 574	1, 165	51. 4
District of Columbia.....	1, 885	1, 217	145. 7	Oregon.....	863	598	37. 5
Florida.....	2, 603	2, 002	64. 6	Pennsylvania.....	5, 213	( <sup>2</sup> )	<sup>2</sup> 44. 2
Georgia.....	1, 985	1, 947	55. 4	Rhode Island.....	408	347	42. 5
Idaho.....	230	173	28. 5	South Carolina.....	1, 251	862	40. 5
Illinois.....	5, 019	4, 481	50. 2	South Dakota.....	191	140	21. 1
Indiana.....	1, 900	1, 683	41. 0	Tennessee.....	3, 851	2, 131	65. 4
Iowa.....	689	506	19. 1	Texas.....	4, 385	( <sup>2</sup> )	<sup>2</sup> 53. 5
Kansas.....	470	461	23. 0	Utah.....	163	153	20. 8
Kentucky.....	2, 562	2, 276	78. 1	Vermont.....	382	171	46. 0
Louisiana.....	2, 330	( <sup>2</sup> )	<sup>2</sup> 62. 1	Virginia.....	4, 228	( <sup>2</sup> )	<sup>2</sup> 84. 6
Maine.....	419	380	43. 0	Washington.....	2, 497	1, 223	49. 6
Maryland.....	2, 720	( <sup>2</sup> )	<sup>2</sup> 72. 4	West Virginia.....	1, 221	1, 141	58. 5
Massachusetts.....	2, 397	( <sup>2</sup> )	<sup>2</sup> 35. 9	Wisconsin.....	1, 483	1, 058	29. 9
Michigan.....	6, 152	4, 066	60. 6	Wyoming.....	96	56	18. 2
Minnesota.....	2, 230	821	27. 2	Continental United States.....	109, 837	<sup>2</sup> 85, 607	<sup>2</sup> 55. 0
Mississippi.....	1, 233	1, 139	52. 4	Alaska.....	956	743	408. 2
Missouri.....	2, 302	2, 086	51. 4	Hawaii.....	620	350	67. 0
Montana.....	324	192	32. 5	Puerto Rico.....	6, 236	5, 510	246. 0
Nebraska.....	231	225	16. 4	United States and Territories.....	117, 649	<sup>2</sup> 92, 210	<sup>2</sup> 58. 1
Nevada.....	130	121	67. 2				
New Hampshire.....	177	149	27. 7				

<sup>1</sup> Rate based on population as of July 1, 1952.

<sup>2</sup> A definite count not available for the entire year; rate computed from estimates based on incomplete data.

<sup>3</sup> Includes estimates for 6 States with incomplete data.

SOURCE: Annual tuberculosis reports and other reports from States and Territories.

Puerto Rico were substantially higher than the rate for Arizona. No doubt part of the difference in rates reflects the relative effectiveness of case finding and reporting in each State. On the other hand, it seems probable that large

differences in the rates generally indicate actual differences in the incidence of the disease.

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# Membrane Filter Procedure Applied in the Field

By EDMUND J. LAUBUSCH, M.S., EDWIN E.  
GELBREICH, M.S., and HAROLD L. JETER, M.A.

**I**N THE PLANNING of public health procedures appropriate for field use or in the event of a natural or wartime disaster, there is a recognized need for quick detection of bacterial pollution of water supplies. For this purpose, application of membrane filter techniques has been proposed, primarily because the 4 to 5 days required to perform coliform enumerations can be reduced to 18 to 20 hours by use of the membrane filter, without apparent loss of validity of results.

Application of the membrane filter in an emergency implies that the tests be completed under field conditions, with minimum availability of standardized laboratory equipment and supplies. It is recognized, also, that in certain situations there may be need for culture incubation by other methods than conventional laboratory incubation. Previous descriptions (1, 2) of EHC Endo medium have specified preparation of the medium on the day of use, thereby necessitating probable preparation under field conditions. In addition, the fragility of glass petri dishes renders them of questionable value in such operations.

The studies which are reported here dealt with (a) a specially designed garment to incubate inoculated membrane filters, utilizing body warmth as a source of heat; (b) the applicability of more durable containers to field-culture methods; and (c) the feasibility of using stored, fully prepared Endo medium to avoid the necessity of mixing the medium in the field.

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*Mr. Laubusch is a sanitary engineer with the Division of Sanitation, Public Health Service, Washington, D. C.; Mr. Geldreich and Mr. Jeter are bacteriologists with the Environmental Health Center, Cincinnati, Ohio.*

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**Garment for incubation of inoculated filters by body heat of wearer.**

## Sample Filtration

Equipment suitable for membrane filtration has been adequately described (1-4). All the filtrations in this investigation were made in the laboratory, in order to compare the "field type" of test with the laboratory test as a control procedure. An electric vacuum pump was the only piece of equipment used that might not be available in a disaster area. Samples of water were collected in bulk and were filtered within 2 to 3 hours from the time of collection.

Use of the standard metal or glass-holding apparatus is feasible for field work. The differential pressure across the membrane can be obtained by using a hand-operated bicycle pump with the leathers reversed, a rubber bulb aspirator, or an evacuated container. Field sterilization of the apparatus can be accomplished by immersion for 5 minutes in boiling water, by flaming alcohol, or by the incomplete combustion of methyl alcohol (1, 2, 5). Re-sterilization of the filter holder between filtrations of successive samples is not usually re-

quired. Rinsing down the funnel walls with a small amount of sterile water two or three times, after sample filtration but before removal of the membrane, reduces the residual micro-organisms to insignificant levels.

### Culture Containers

A satisfactory container should: (a) be non-breakable, of chemically inert material which can be easily cleaned; (b) be suitable for sterilization either by heat or by chemical procedures; (c) have air- and water-tight seal, to prevent leakage of medium, contamination, or loss of humidity; (d) be convenient to use, inexpensive, and readily available.

Probably no single type of container fully meets all of these requirements. Two types of containers have been examined extensively with regard to the above criteria. One was an ordinary 2-oz. ointment tin, 50-60 mm. in diameter, available from most laboratory equipment distributors, large drug stores, or drug supply companies. The other was a disposable plastic petri dish, 50 mm. in diameter. Tests using these containers were run in parallel with the 60-mm. glass petri dishes routinely used in this laboratory for membrane filter studies.

### Culture Media

All membranes were incubated for 2 hours on M-enrichment medium (Difco) followed by transfer to EHC Endo medium for final incubation of 16 to 18 hours. The EHC Endo medium used in the medium storage experiments was kept in screw-capped tubes until time for use.

### Sterilization Procedures

In these investigations, a laboratory autoclave was used to sterilize all materials. For field use, a pressure cooker (such as is used for home-canning purposes) could be substituted.

Equipment, such as funnels, metal containers, and graduates, was sterilized for 15 minutes at 121° C. (15 lbs.). Whenever it was necessary to dry this equipment rapidly, the escape valve of the autoclave was opened to reduce the steam pressure.

(The plastic petri dishes could be sterilized

by soaking for 2 hours or longer in 70-percent ethyl alcohol. The alcohol must be allowed to drain from the dishes before using them.)

The membrane filters were separated from the kraft paper dividers (leaving the white blotting paper inserts in place), wrapped loosely in kraft paper (about 10 to each package), and sterilized in the autoclave for 10 minutes at 115° C. (10 lbs.). At the end of the sterilization period, the escape valve was opened to reduce the pressure in the autoclave to atmospheric pressure. (This was essential to protect the membranes from excessive moisture.)

The enrichment medium and EHC Endo base were autoclaved 15 minutes at 121° C. The 20-percent lactose solution was autoclaved 10 minutes at 115° C.

### Field Incubation

The incubation assembly (see photograph) consisted of a sleeveless, vestlike garment, adaptable to a torso of almost any size and equipped with adjustable elastic strappings to hold the garment in place and to permit maximum dexterity of the operator. The vest, worn in direct body contact for maximum heat transfer, held 21 incubation containers in pouches located on the front side. Incubation containers were inserted vertically into these pouches so that the bottom (thus, the nutrient pad and membrane) was closest to the body and was separated from the skin by a nylon marquisette fabric which formed the inner lining of the garment. The front side of the pouches was lined with nylon-faced, rubberized cloth to minimize heat losses. A heavy-grade cotton oxford cloth was used as an overlay veneer and extended around the back of the torso, where it was fastened.

Experimental tests consisted of body incubation of inoculated membranes, contained in metal and plastic containers, for the established periods. Parallel tests were made with membranes cultured in glass petri dishes and incubated in a laboratory high-humidity incubator at 35° C.

### Results

In table 1, quantitative coliform recovery in the metal and plastic dishes is compared

with recovery in the control test, in which glass dishes were used. Counts are average values of duplicate membranes. All water samples were from farm wells.

Average coliform counts of four replicate samples from a group of rural well waters incubated in the conventional, constant-temperature, high-humidity incubator, and a parallel series incubated at body temperature in the incubator vest, are shown in table 2. Both types of containers, the ointment tin and the plastic petri dish, were used in this evaluation.

Coliform recoveries on stored EHC Endo medium, as compared with the results from freshly prepared EHC Endo medium, are shown in table 3.

These values were based on four replicate filtrations for each of the two media.

#### Discussion

Comparison of coliform recovery results from the tin and from the plastic containers (table 1) with the recoveries from standard glass petri dishes indicated that any of these containers could be used interchangeably. Lab-

oratory observations demonstrated no consistent variation in either colony size or quality of the characteristic sheen of coliform colonies.

Both the plastic dish and the metal container satisfied most of the criteria outlined for optimum field performance. It was shown that these containers could be incubated in any position without interference from spreading growth caused by condensed moisture falling on the membrane. There appeared to be sufficient adhesive power in a properly saturated nutrient pad to keep the membrane in a fixed position on the bottom of the container. The containers were sufficiently tight to prevent evaporation of the nutrient and to preserve a sufficiently humid atmosphere. (However, several containers were not leakproof, so that medium did seep out. This resulted in staining the incubator vest and occasionally the clothing worn adjacent to the vest.)

Other discomforts to the wearer were associated with continuous wearing of the vest, such as heat buildup and difficulties in sleeping. Under nonemergency conditions, some other means of supplying suitable temperatures, for example, a portable incubator or thermos jar,

**Table 1. Average coliform recoveries from experimental tin and plastic containers in relation to standard glass containers**

Ointment tin containers				Plastic containers			
Sample No.	Coliforms/100 ml.		Recovery ratios <sup>1</sup>	Sample No.	Coliforms/100 ml.		Recovery ratios <sup>1</sup>
	Standard test	Experimental test			Standard test	Experimental test	
1-----	2,000	2,300	1.15	11-----	37	55	1.49
2-----	600	420	.70	12-----	900	700	.78
3-----	180	140	.78	13-----	220	270	1.23
4-----	320	330	1.03	14-----	4	4	1.00
5-----	260	270	1.04	15-----	300	320	1.06
6-----	360	310	.86	16-----	100	110	1.10
7-----	140	160	1.14	17-----	13	14	1.08
8-----	540	490	.91	18-----	7,200	8,600	1.19
9-----	33	50	1.51	19-----	35	29	.83
10-----	280	300	1.07	20-----	120	110	.92
Average-----	-----	-----	1.02	Average-----	-----	-----	1.07

<sup>1</sup> "Recovery ratios" are the ratios of the mean number of coliform colonies in the experimental culture containers to the mean number of coliform colonies in the conventional glass Petri dishes (standard test).



**Table 2. Average coliform recoveries from tin and plastic containers using conventional and body incubation**

Sample	Ointment tin containers (coliforms/100 ml.)		Recovery ratios	Sample	Plastic containers (coliforms/100 ml.)		Recovery ratios
	Standard incubation	Body incubation			Standard incubation	Body incubation	
1-----	220	220	1.00	11-----	660	530	0.80
2-----	2,300	2,800	1.22	12-----	880	1,000	1.14
3-----	420	540	1.28	13-----	270	270	1.00
4-----	140	240	1.71	14-----	380	530	1.39
5-----	330	300	.91	15-----	320	300	.94
6-----	260	300	1.15	16-----	110	130	1.18
7-----	300	270	.90	17-----	14	18	1.29
8-----	170	170	1.00	18-----	8,600	9,200	1.07
9-----	480	640	1.33	19-----	1,100	1,500	1.36
10-----	50	50	1.00	20-----	29	32	1.10
Average-----			1.15	Average-----			1.13

may better serve the purpose of incubation in field examinations of water supplies.

Steam or hot-air sterilization of the metal culture containers resulted in development of scale and rust after repeated use. Both types of culture containers were considered to be disposable, and could be taken into the field in a sterile condition, used once, and discarded. The low cost of these containers made the practice economically feasible.

According to the data in table 2, it appeared that when the body served as the source of heat, coliform recoveries were equal to those obtained from conventional incubation. Colonies incubated by body heat were noticeably smaller, necessitating occasional extension of incubation time to insure complete development and optimum differentiation of coliform colonies. The smaller size often was advantageous, because it helped to minimize interference with coliform differentiation due to overcrowding and confluence of colonies.

Frequent random temperature observations in the pouches of the incubation vest, made over a 6-week period in which the vest was used, indicated maintenance of a relatively constant and uniform temperature range. The limits were 33.5° C. and 35.5° C.

From the data in table 3, it appeared that

limited-duration storage of the EHC Endo medium had no discernible effect on quantitative coliform recovery. Similarly, colony size and sheen characteristics appeared not to be adversely affected with storage up to 3 or 4 weeks. Thus, fully prepared Endo medium, previously mixed in the laboratory, can be taken out into the field for medium-transfer purposes.

These results suggest application of field incubation procedures to small-scale surveys in remote areas where accurate results must be obtained quickly by starting or completing incubation at the sampling site. The body incubation modification is particularly applicable

**Table 3. Average coliform recoveries on stored and freshly prepared medium**

Number of days stored	Recovery ratios of stored Endo media at—	
	Room temperature	4° C.
19-----	0.96	0.93
25-----	1.09	.96
28-----	1.15	1.02
32-----	1.09	1.00

to civil defense activities and disaster relief, where laboratory facilities may not be conveniently available.

### Conclusions

1. Both tin and plastic containers possess the merits of simplicity, mechanical durability, and membrane filter adaptability.

2. Equally satisfactory results are obtainable by use of the metal or the plastic container as a culture dish for membrane filters.

3. The incubator vest is an acceptable device for utilizing body heat for the incubation of membrane filters under field or emergency conditions.

4. The EHC-modified Endo medium may be stored for 3 or 4 weeks without destroying the usefulness of the medium.

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## Public Health Service Staff Announcements

**Dr. Harold M. Janney** has been appointed medical director of the Bureau of Prisons, Department of Justice. Since 1950 Dr. Janney has been medical director of the United States Penitentiary, Atlanta, Ga. He has had progressively responsible appointments in the Federal prison system since his initial Public Health Service assignment as medical staff officer at the Federal Reformatory, Chillicothe, Ohio, in 1936.

**Dr. Joseph O. Dean**, formerly associate chief of the Bureau of State Services, Public Health Service, on September 15 was named as an assistant to the medical director of the Bureau of Indian Affairs, Department of the Interior. Prior to his assignment as associate chief in 1949, he served as district director and regional medical director of Region VII, with headquarters in Kansas City, Mo.

Dr. Dean was appointed to the Regular Corps of the Public Health Service in 1929, and received his master of public health degree in 1937 from the Johns Hopkins School of Hygiene and Public Health. During his career, he served at quarantine stations in New York and New Orleans. From 1937 to 1941 he made studies of public health administration in rural areas and also of the activities of various county health departments. From 1941 to 1944 he was stationed in San Juan, Puerto Rico, as medical consultant.

During World War II, Dr. Dean was concerned with activities relating to emergency health and sanitation, serving first as assistant chief of the Division of States Relations and later as chief of the Office of Surplus Property. From October 1946 to October 1947, he was assistant chief of the Division of Commissioned Officers.



## Demographic Characteristics of Latin America

Limited and brief though it is, this review emphasizes the magnitude of the disease problem in Latin America. It supports the thesis that the population is young, that mortality rates are high (especially in the early years of life), and that infectious and parasitic diseases are responsible for most of the morbidity and mortality drain on the population.

**M**OST OF THE TERRITORY of the Latin American Republics lies between the Tropic of Cancer and the Tropic of Capricorn. During the decade 1942-52, the Institute of Inter-American Affairs cooperated in the field of public health with 18 of the 20 countries in this region. Fourteen of these 18 countries are wholly within the Torrid Zone. Only one, Uruguay, is completely in the Temperate Zone. The remaining three lie partly in both zones. It is therefore to be expected that tropical or subtropical diseases would be found in almost all of these countries. In the areas of high altitude, which characterize the Andean regions in particular, the diseases are likely to

be those of a Temperate Zone, though the region lies completely in the Tropics.

The *Servicios*, therefore, were confronted with both temperate and tropical disease problems. The characteristics of the problems were not difficult to define, but their magnitude was less readily determined. The reasons for the latter stem, in considerable part, from the inadequacies of the morbidity and mortality data available. By using both direct and indirect evidence, however, it was possible to formulate a reasonably true picture of the disease problems.

### Mortality Rates

Data on the number of deaths and the death rates in seven Latin American countries for 1942 and 1949 (table 1) indicate that considerable improvement in health conditions has taken place during this 7-year period. When these data are compared with comparable data for the United States (table 1), however, it is evident that these countries are in a position to benefit still more from intensive efforts to improve health services. For example, the crude death rate in Chile in 1949 was 2.2 per 1,000

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This material on demographic characteristics and that following on specific diseases and nutrition are the sixth and seventh in a series of excerpts from the report on the Public Health Service's evaluation of a decade of cooperative health programs of the Institute of Inter-American Affairs. The background of the report and of these excerpts will be found in Public Health Reports for September 1953, beginning on page 829.

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**Table 1. Number of deaths and death rates per 1,000 population in selected countries (stillbirths excluded)**

Country	1942			1949		
	Population (in thou- sands)	Number of deaths	Death rate	Population (in thou- sands)	Number of deaths	Death rate
Mexico.....	20, 657	471, 600	22. 8	24, 448	<sup>1</sup> 438, 300	<sup>1</sup> 17. 9
Nicaragua.....	1, 023	17, 186	16. 8	1, 184	11, 910	10. 1
El Salvador.....	1, 849	38, 250	20. 7	2, 150	28, 339	13. 2
Chile.....	5, 130	104, 122	20. 3	5, 712	103, 384	18. 1
Colombia.....	9, 469	151, 809	16. 0	11, 015	154, 662	14. 0
Peru.....	7, 272	92, 804	13. 4	8, 240	<sup>1</sup> 85, 406	<sup>1</sup> 10. 8
Venezuela.....	3, 906	63, 528	16. 3	4, 595	57, 477	12. 5
United States.....	134, 831	1, 385, 187	10. 4	149, 149	1, 443, 607	9. 7

<sup>1</sup> Provisional data.

SOURCE: Statistical Office of the United Nations, Demographic Yearbook, 1951.

population lower than the rate in 1942; yet in both years the Chilean rate was about twice that for the United States.

### *By Age*

More significant than general death rates are the rates by age and by cause of death. The data in table 2 show that people in the five Latin American countries shown are prone to

die young. The mortality rates for the first year of life and for the succeeding 4 years are uniformly high in comparison with the rates for the United States. These rates are known to be susceptible of substantial and rapid reduction by effective health services. The evidence, therefore, leads to the conclusion that uniformly effective health services have not yet been developed in most of these countries.

**Table 2. Death rates per 1,000 population in selected countries, by age (stillbirths excluded)**

Age group (years)	Mexico 1940	Nicaragua 1940	Chile 1940	Colombia 1938	Venezuela 1941	United States 1940
All ages.....	23. 3	14. 4	21. 5	17. 3	16. 2	10. 8
Under 1 year.....	205. 3	93. 0	239. 9	150. 5	126. 9	54. 6
1-4.....	48. 2	23. 2	31. 5	28. 5	21. 3	2. 9
5-9.....	7. 9	5. 3	2. 8	5. 8	5. 2	1. 1
10-14.....	4. 0	2. 4	3. 3	3. 1	<sup>1</sup> 4. 1	1. 0
15-19.....	6. 0	4. 1	6. 6	4. 5	-----	1. 7
20-24.....	9. 0	6. 6	9. 4	6. 2	<sup>2</sup> 8. 3	2. 4
25-29.....	10. 0	7. 9	9. 5	7. 1	-----	2. 8
30-34.....	11. 5	8. 9	10. 1	8. 5	<sup>3</sup> 11. 4	3. 4
35-39.....	13. 2	9. 0	10. 9	9. 7	-----	4. 4
40-44.....	15. 4	11. 0	12. 9	<sup>4</sup> 12. 7	<sup>4</sup> 15. 1	6. 1
45-49.....	18. 0	13. 1	15. 5	-----	-----	8. 7
50-54.....	21. 6	14. 5	19. 3	<sup>5</sup> 18. 8	<sup>5</sup> 21. 5	12. 8
55-59.....	27. 1	19. 0	27. 3	-----	-----	18. 6
60-64.....	40. 4	24. 7	35. 4	<sup>6</sup> 35. 6	<sup>7</sup> 58. 1	26. 8
65-69.....	54. 8	42. 4	53. 9	-----	-----	39. 2
70-74.....	84. 7	55. 4	72. 5	<sup>8</sup> 93. 2	-----	61. 1
75-79.....	108. 0	98. 0	103. 1	-----	-----	94. 8
80-84.....	161. 1	98. 8	134. 2	-----	-----	145. 6
85 and over.....	295. 2	129. 0	238. 8	-----	-----	235. 7

<sup>1</sup> Rate for ages 10-19. <sup>2</sup> Rate for ages 20-29. <sup>3</sup> Rate for ages 30-39. <sup>4</sup> Rate for ages 40-49. <sup>5</sup> Rate for ages 50-59. <sup>6</sup> Rate for ages 60-69. <sup>7</sup> Rate for ages 60 and over. <sup>8</sup> Rate for 70 and over.

SOURCE: Statistical Office of the United Nations, Demographic Yearbook, 1951.

### By Causes of Death

The value of mortality data for specific diseases, such as those shown in table 3, in defining the disease problems of Latin America is limited by two factors. First, the proportion of registered deaths in many Latin American countries listed as due to ill-defined or unknown cause is comparatively large. For example, in the countries included in the table, the percentages of registered deaths recorded as due to ill-defined or unknown cause were 23.6 for Colombia, 15.2 for Peru, 6.0 for Costa Rica, and 21.0 for El Salvador; the percentage for the United States was 1.2. Second, medical certification applies to only a part of the registered deaths. In Colombia, 41.7 percent of registered deaths in 1947 were medically certified. In the same year, the percentage in Costa Rica was 59.0; in El Salvador, 16.7; in Mexico, 51.0; in Chile, 71.8; and in Uruguay, 97.7.

Despite these limitations, there is fair agreement among the specific disease rates for the

several countries. The highest mortality rates among the infectious diseases are usually for diarrhea and enteritis, followed by those for tuberculosis, malaria, and whooping cough, but with bronchitis and influenza frequently occupying important positions. It may be that some of the tuberculosis deaths are reported as bronchitis deaths, which would serve to magnify the importance of the latter.

### Striking Differences

When the specific disease rates of these four Latin American countries are compared with those of the United States, the most striking differences are (a) the higher incidence of deaths due to the infectious diseases, especially those usually associated with infancy and early life; and (b) the lower incidence of deaths from cancer, heart disease, and nephritis, which are characteristic of the later years of life. A similar picture is presented in table 2, in that the favored mortality position of the younger age groups in the United States largely dis-

**Table 3. Number of deaths and death rates per 100,000 population in five countries, by selected cause (stillbirths excluded)**

Cause	United States 1948		Colombia 1948		Peru 1948		Costa Rica 1949		El Salvador 1948	
	Number of deaths	Death rate	Number of deaths	Death rate	Number of deaths	Death rate	Number of deaths	Death rate	Number of deaths	Death rate
All causes.....	1, 444, 337	989. 0	154, 392	1, 432. 6	83, 022	1, 074. 3	9, 884	1, 179. 4	30, 527	1, 454. 3
Typhoid and paratyphoid.....	233	. 2	1, 560	14. 5	854	11. 1	50	6. 0	82	3. 9
Whooping cough.....	1, 146	. 8	3, 856	35. 8	5, 970	77. 2	235	28. 0	751	35. 8
Diphtheria.....	634	. 4	485	4. 5	141	1. 8	61	7. 3	29	1. 4
Tuberculosis (all forms).....	43, 833	30. 0	4, 623	42. 9	6, 786	87. 8	439	52. 4	845	40. 2
Malaria.....	170	. 1	2, 929	27. 2	2, 002	25. 9	525	62. 6	2, 794	133. 1
Syphilis.....	11, 616	8. 0	655	6. 1	170	2. 2	51	6. 1	372	17. 7
Influenza.....	5, 068	3. 5	2, 067	19. 2	6, 468	83. 7	24	2. 9	344	16. 4
Smallpox.....	5	0	463	4. 3	1, 672	21. 6	-----	-----	-----	-----
Measles.....	888	. 6	760	7. 1	1, 343	17. 4	21	2. 5	142	6. 8
Typhus fever.....	177	. 1	1, 537	14. 3	1, 392	18. 0	4	. 5	1	0
Diarrhea and enteritis.....	8, 831	6. 0	15, 470	143. 5	3, 964	51. 3	1, 594	190. 2	5, 872	279. 7
Other infectious or parasitic diseases.....	9, 178	6. 3	6, 792	63. 0	2, 304	29. 8	756	90. 2	1, 325	63. 1
Cancer.....	197, 042	134. 9	3, 462	32. 1	974	12. 6	492	58. 7	378	18. 0
Heart diseases.....	471, 469	322. 8	6, 733	62. 5	2, 867	37. 1	737	87. 9	363	17. 3
Nephritis.....	77, 377	53. 0	3, 827	35. 5	-----	-----	203	24. 2	254	12. 1
Bronchitis.....	3, 450	2. 4	7, 137	66. 2	2, 173	28. 1	418	49. 9	1, 437	68. 5
Ill-defined or unknown cause.....	18, 082	12. 4	36, 602	339. 6	12, 663	163. 9	593	70. 8	6, 423	306. 0

SOURCE: Statistical Office of the United Nations, Demographic Yearbook, 1951.

appears in the older age groups where the degenerative diseases begin to take their toll.

The young-age deaths that characterize the Latin American countries constitute a tremendous drain on the human resources of the region and are an economic handicap of first importance. The seriousness of the situation is mitigated only by the knowledge that these deaths are largely preventable.

As a result of the high mortality in Latin America, especially during infancy, life expectancy is well below that of Western Europe, Canada, and the United States. In Latin America it ranges from 35 years in Venezuela (1949) to 46 in Colombia (1947); in Canada and the United States, it is from 65 to 70 years.

### Morbidity Rates

The damage inflicted upon a population by disease is measured more accurately by the number of illnesses produced than by the number of deaths that ensue. Typhoid fever, for example, results in death in about 10 percent of the cases, and this percentage is substantially lowered when appropriate treatment with chloromycetin is employed. Malaria, which ranks with tuberculosis as the world's most prevalent disease, produces death in a relatively small percentage of cases. A somewhat similar situation occurs with most of the infectious and parasitic diseases of man. It is clear, therefore, why the mortality record is quite inadequate to evaluate the burden occasioned by disease. The incapacitation and economic loss that result from illnesses are together the true measure of their importance to mankind.

It is well known that the reporting of illnesses in Latin America is incomplete. Even if a satisfactory reporting system could be devised, it could not operate in these countries since in none of them is there a sufficient number of physicians to attend all the sick. In many sections, notably the rural areas, there are no physicians at all. The most reliable statistics are to be found in the cities and towns where physicians are relatively numerous.

Some idea of the volume of illnesses in Latin America may be obtained from the data for Colombia shown in table 4. It can be estimated that there were at least 1,000,000 illnesses in this country in 1948, if the experience in the half of the population not represented by these data was similar to that shown. Taking into account the many illnesses unattended by a physician and the many that for one reason or another were not reported, the number was probably much greater. In the same year Colombia reported 154,392 deaths from all causes. The total picture of disease thus includes the morbidity as well as the mortality experience.

**Table 4. Reported illnesses in Colombia, 1948**

[209 of 815 municipalities reporting,\* representing about half of Colombia's population]

Illness	Number of cases	Rate per 100,000 population
Malaria.....	89,727	1,655
Influenza.....	75,756	1,398
Intestinal parasites.....	72,421	1,336
Hookworm infestation.....	40,228	742
Amoebic dysentery.....	38,395	708
Gonorrhea.....	29,614	960
Syphilis.....	27,158	501
Whooping cough.....	20,057	859
Typhoid and paratyphoid.....	11,207	207
Measles.....	11,169	478
Scabies.....	10,273	189
Tuberculosis of lungs.....	8,667	160
Pneumonia.....	8,599	158
Chancroid.....	7,802	253
Smallpox.....	7,356	71
Diarrhea and enteritis (under 2 years of age).....	6,875	11,699
Erysipelas.....	5,255	97
Mycosis.....	3,883	71
Typhus fever.....	3,471	90
Pinta.....	3,395	62
Relapsing fever.....	3,085	57
Chickenpox.....	2,954	54
Mumps.....	2,790	51
Yaws.....	2,357	43
Diphtheria.....	2,238	96
Tuberculosis, other than respiratory.....	416	7
Bartonellosis.....	25	.05
Undulant fever.....	4	.07
Other illnesses.....	9,441	-----
Total.....	504,618	-----

SOURCE: J. W. Mountin, The Basis of a Development Program for Colombia. Washington, D. C., the International Bank for Reconstruction and Development, 1950.





## Disease and Nutritional Barriers to Health

Clearly, ill health reduces manpower and retards economic progress. In these excerpts some of the specific disease problems of our southern neighbors are outlined, and some of the main lines of attack by the Servicios are traced. The "nutritional spectrum," heavily weighted on the side of malnourishment, is described, together with the efforts toward improvement.

**E**XAMINATION of mortality and morbidity data leads to the conclusion that malaria and tuberculosis were the outstanding disease problems in Latin America during the decade 1942-52. Such diseases as yaws, hookworm disease, Hansen's disease, schistosomiasis, and epidemic typhus, however, also constituted problems, and in some areas one or another of these rivaled malaria and tuberculosis for a top-ranking position.

In Haiti, for example, it is believed that yaws has attacked one-third of the population of 3,000,000 and that at any one time there are at least 50,000 active cases.

Hookworm disease was, and still is, a major problem in tropical and subtropical areas where climatic and soil conditions are favorable and where the disposal of human feces is improperly provided for. This disease represents a heavy burden on the productive capacity of the population.

There are more than 37,000 known cases of Hansen's disease in Brazil, 8,000 in Colombia, and about 8,000 in Mexico. Other countries have a few hundred to a few thousand cases each. Since there are no certain means of preventing or of curing this disease, it is still necessary to provide custodial care for thousands of infected individuals.

Schistosomiasis is limited to a few areas of Latin America, but the necessary intermediate host, a snail of the genus *Planorbis*, is widely

distributed in several of the countries. This disease represents a serious threat since as yet no wholly practical and effective means of control has been devised.

Epidemic typhus and murine, or endemic, typhus are prevalent in the Andean region particularly and may be found in other parts of Latin America. Fortunately, the means to control epidemics, and perhaps to prevent them as well, are available.

Other diseases found in Latin America include Chagas' disease, plague, bartonellosis, brucellosis, and onchocerciasis, as well as the more commonly known diseases, such as typhoid fever, the dysenteries, smallpox, diphtheria, measles, and whooping cough.

Though knowledge is far from complete in respect to the importance of specific diseases in infant mortality, it is generally accepted that a major portion of the infant deaths result from intestinal infections. The *Shigella* and *Salmonella* groups of bacteria and probably certain viruses which are as yet not clearly determined are the causal agents. Malnutrition, either alone or in conjunction with an infectious agent, is also assigned a significant role in infant deaths.

### Chiefs of Field Party Analysis

A series of reports drafted by the chiefs of the United States field parties offered an op-

portunity to compare the conclusions reached by a study of official records with the impressions and opinions of competent resident observers.

In 1949, the chiefs of field party had been requested to furnish a list of the 10 diseases which were considered the most serious public health problems in the countries in which they were resident. Since the instructions did not specify the characteristics of a disease which permit it to be designated a public health problem nor provide criteria whereby importance might be measured, it was to be expected that the replies would lack uniformity and would include a wide range of disease entities.

A total of 35 different diseases were enumerated as major public health problems in the 13 lists returned. Of these only one disease, tuberculosis, appeared in all the lists. Syphilis and typhoid fever were each included in 12 lists, malaria in 11, and whooping cough in 10. No other disease approached such unanimity except measles, which was included in 8 lists.

Such intestinal diseases as diarrhea, enteritis, the dysenteries, typhoid fever, and paratyphoid fever considered as a group, as is justifiable on epidemiological grounds, were listed 25 times. Acute infectious diseases—whooping cough, measles, diphtheria, chickenpox, meningitis, and smallpox—were listed 31 times.

First priority was accorded tuberculosis on 7 lists and malaria on 3; the remaining 3 lists gave priority to whooping cough, yaws, and "diarrhea and enteritis under 2 years of age," respectively.

The interesting feature of this analysis is not the diverse responses, but the agreement among the chiefs of party as to the diseases which deserve to rank as the first five. These were tuberculosis, syphilis, the enteric infections, malaria, and whooping cough, the very same infectious diseases commonly found to rank high in the morbidity and mortality records of Latin America. With the exception of tuberculosis, these diseases respond favorably to prophylactic and therapeutic measures commonly available, and none of them needs to remain a potent enemy to man. The various Latin American national health services have it within their power to reduce the prevalence of any or all of them to relatively small proportions.

## Nutrition

Nutrition plays a determining role in the health of every individual, irrespective of race, age, sex, occupation, or place of residence. The well-nourished and the malnourished, including both the overnourished and the undernourished, form a complete nutritional spectrum of every population group. Studies made in Latin America indicate that the nutritional spectrum is heavily weighted on the side of malnourishment in large groups of the population, but until additional, extended studies have been made, no reliable estimate of its distribution is possible. From casual observation, it is assumed, however, that malnutrition is an important problem.

On the basis of spot surveys and laboratory studies, the National Institute of Nutrition of Colombia claims that poor nutrition affects a large portion of the population of that country. This was evidenced by altered height, weight, and body measurements of the people as well as by decreased work capacity and the presence of clinical findings. The diet of the Colombians was shown to be low in proteins, fats, vitamins, and essential minerals, and to be high in carbohydrates.

It is well known that hookworm disease, malaria, and tuberculosis are intimately related to malnutrition in many persons who suffer from these diseases, but whether or not the relationship is causal defies affirmation except in certain individual situations. The sufferer of malaria or hookworm disease may be malnourished because of the anemia that reduces his productive and earning capacity and therefore his ability to provide for his food needs. Or the malnourished person, as a result of diminished resistance, may fall an easy victim to such diseases. Whatever may be the relationship, it is clear that the well-being of the individual is compromised by malnutrition as well as by certain specific diseases.

By 1942, a number of the Latin American countries were already interested in nutrition. Uruguay created a Department of Nutrition and Dietetics in its Ministry of Health in 1934, and about the same time a National Commission for Nutrition was formed. Two years later Mexico established a Nutrition Re-

search Institute. By 1951, there were 6 nutrition institutes and 9 divisions or departments of nutrition in one or another ministry in the 18 Latin American countries in which health and sanitation *Servicios* were in operation. This is strong evidence of a growing appreciation of the importance of nutrition, but the development can scarcely be said to be on a scale commensurate with the magnitude of the problem.

## Servicio Projects

The distribution of the *Servicios*' expenditures among the major categories of their activities in the field of specific diseases and nutrition is summarized in the accompanying table.

### *Malaria Control*

Because of the wartime objectives of the bilateral health programs, malaria control projects were among the earliest undertaken. During the last 8 months of 1942, 30 of the 36 projects in the field of specific diseases were for malaria control.

The rather large sum spent in the control of a single but very important disease was expended as follows: 51.7 percent for permanent drainage projects; 39.4 percent for temporary drainage projects and for larviciding; 5.4 percent for DDT house-spraying activities; 1.5 percent for studies and surveys. The remainder covered projects related to personnel training, treatment, screening, and the like.

**Number of projects and expenditures in the field of specific diseases and nutrition, 1942 through June 30, 1951**

Activity	Number of projects	Total expenditures	Percentage of total expenditures
Malaria.....	163	\$9,522,223.67	59.7
Tuberculosis.....	13	2,715,303.46	17.0
Other specific diseases.....	50	2,195,322.29	13.7
Communicable diseases: hospitals and departments.....	6	1,039,875.73	6.5
Nutrition.....	6	469,478.18	2.9
Total.....	238	15,942,203.33	99.8

The proportionately large amount spent for permanent control measures, mostly drainage, appears to be in line with good planning. DDT was not available until late in the period.

### *Tuberculosis Control*

The promptness with which the *Servicios* were able to evaluate the malaria situation and assist in its improvement was not paralleled in any other of the specific disease situations or in nutrition. Ready-made opportunities such as were available at the outset in the malaria field were not so apparent in the other fields, nor was there, with certain exceptions, a comparable mass of knowledge which could be drawn up and applied.

Tuberculosis, for example, is not a disease for which there is a specific treatment or a proved method of prevention. Only 13 tuberculosis projects were developed during the 10-year period. Six of these were tuberculosis hospital and sanatorium construction projects, utilizing 80 percent of the funds in this category. The remainder provided for projects in the actual diagnosis and care of patients in three dispensaries, for the operation of a tuberculosis sanatorium, and for support of three BCG campaigns.

No funds were designated for the field studies and research which are essential if the tuberculosis control program in Latin America is to be well oriented. Some support of tuberculosis research was provided in Santiago, Chile, however, through the aid given to the Quinta Normal Health Center, and in many countries aid to the tuberculosis campaigns was provided through support of various health centers and by the specialization of personnel through the Institute's fellowship program.

### *Other Areas*

Eighteen specific diseases other than malaria and tuberculosis were considered sufficiently important to justify the expenditure of *Servicio* funds for their control. Of the total amount spent, 91.9 percent was devoted to control projects, 4.6 percent to buildings and equipment, and about 2.6 percent to immunization campaigns. Only \$18,905 was devoted to studies, although in a number of the control projects a certain amount of field investigation was in-



herent in the operations. These specific diseases included anthrax, bartonellosis, brucellosis, diphtheria, goiter, hookworm disease, Hansen's disease, meningitis, onchocerciasis, plague, poliomyelitis, schistosomiasis, smallpox, typhoid fever, typhus fever, the venereal diseases, yaws, and yellow fever.

General aid was given to improve the communicable disease services in 2 countries and to build 3 infectious disease hospitals in a third.

Support to nutrition work was supplied in 5 countries. In 4 countries, equipment and supplies were provided, and in 2, aid was given in the development of a nutrition and food control service.

## Evaluation of Efforts

Although an evaluation of each of the 238 projects in the field of specific diseases and nutrition could not be made in the time available for the survey, certain conclusions regarding various groups were drawn.

### *Malaria*

Although only 5 of the 163 projects for malaria control were active at the end of 1951, it was possible to evaluate the work on a sampling basis. From examination of certain malaria drainage projects, it was determined that such work has withstood the test of time and has achieved the objective for which it was done.

The DDT projects were uniformly successful in controlling malaria even in such areas as the Amazon Valley. The early projects demonstrating the value of DDT were a significant contribution. The chemical was first used by a *Servicio* in Breves, Pará, Brazil, in 1944. The success attained there was followed by success in other areas, and in due course DDT spraying was adopted generally in malarious areas. Although neither the Institute nor any of the *Servicios* may be credited with discovering the value of DDT spraying, they are to be commended for having lost no time in conducting field trials and making available to others the knowledge resulting therefrom.

Since almost 60 percent of the funds used in the field of specific diseases and nutrition was employed against malaria, it is appropriate to ask if this was wise and realistic. It is to be

considered that 82.2 percent of the malaria projects were initiated during the war years and that it was the control of malaria more than of any other disease that was a determining factor in successfully obtaining strategic materials. Furthermore, malaria was recognized as a serious burden operating against the economic well-being of the people of Latin America. For these reasons, the expenditures for malaria control were justifiable and the projects are a credit to those who planned them. This opinion is reinforced by the fact that more than half of the money expended was employed in works which were permanent and therefore of lasting benefit to the countries concerned.

### *Concentration of Effort*

The benefit derived from the work of the *Servicios* in tuberculosis and the 18 other specific diseases, as well as their aid to the development of national services and institutions charged with the control of infectious diseases, is believed to be substantial, but the results might have been more spectacular had there been more concentration of effort. The expenditures made for the control of these several diseases were but slightly over half as great as those made for the control of malaria alone.

### *Plans and Records*

The yaws campaigns serve to illustrate another aspect of the specific disease control work which merits comment. These campaigns have been and are being waged in a few of the Latin American Republics at a total cost of \$1,010,665. They have been of undoubted benefit to the populations affected, but it cannot be said that the incidence of the disease has been lowered substantially, for the records do not indicate either what the incidence rate was at the beginning of the campaigns or what it is now.

The chief criticism of the yaws campaigns and of much of the other work in the field of specific diseases is that baselines were rarely established from which measurement of results could be made. Operations without a baseline might be justified when combating an active epidemic, as was the case in a few instances, but, for the most part, the *Servicios* were in a position to plan each project with care and to main-



tain records which would permit a fair evaluation of precisely what was accomplished. This was not done systematically.

#### *Importance of Nutrition*

*Servicio* directors appeared to be unanimous in their belief that malnutrition was widespread and of such intensity as to constitute a serious health hazard in many parts of Latin America, but relatively little was done to improve the situation. The *Servicios* invested only 2.9 percent of their funds in nutrition projects and developed programs in but 5 of the 18 countries. Much greater attention should be devoted to the problem of nutrition in the future than has been accorded it so far.

#### *Infant Diarrheas*

Another area which calls for greater concentration is the infant diarrheas. Advances have

been made in knowledge of their etiology and epidemiology but not enough to enable the health worker of Latin America to bring them speedily under control. It is believed that additional field studies should be undertaken and persisted in. The hope of reducing the infant mortality which results from the infant diarrheas rests in the first instance upon research.

#### **Conclusion**

The infectious diseases and malnutrition together make up the principal disease burden of the people of Latin America. These diseases are a principal factor in producing the short life span characteristic of the population. Moreover, ill health reduces manpower and retards economic progress. It is recognized, however, that these diseases are largely preventable. Intensified public health measures will assuredly conquer them.

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## From THE CHILD . . . . .

### **Cerebral-Palsied Children**

Believing that many cerebral-palsied children like other youngsters can be brought up in their own homes—New York City has developed four special units for educating them in the public schools. At the same time, the handicapped children receive the special medical and health services they need. These advantages are particularly important for the children's emotional growth and development. From the long-range view, the classes are helping the children attain partial independence and productivity. (See Cerebral-Palsied Children Attend Special Classes in Public Schools—Drs. Helen M. Wallace, Leona Baumgartner, and William Cooper in the August-September 1953 issue of *The Child*.)

A Manual for the Operation of Cerebral Palsy Units in New York City is available

upon request from the Bureau for Handicapped Children, New York City Department of Health, 125 Worth Street, New York 13, N. Y.

### **Rheumatic Fever Problems**

Parents with children convalescing from rheumatic fever have been brought together to discuss common problems and fears. They meet with the staff of the pediatric cardiac clinic at the Grace-New Haven (Conn.) Community Hospital. (Jean Kiningham Igersheimer and Drs. Charles Henry Crothers and Robert B. Kugel describe this program in the August-September issue.)

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*The Child* is issued 10 times a year by the Children's Bureau, U. S. Department of Health, Education, and Welfare. \$1.25 a year (\$1.50 foreign mailing), 15 cents a copy, from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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## Principles of Public Health Program Planning And Their Application in Latin America

Dividends are higher from any well-conceived operation, whether by business or government. Especially in public health undertakings, where outcomes are not easily measurable, is advance planning essential. Here the evaluators describe certain basic principles and the facts and figures necessary for complete program planning, and strike a balance from the record of inter-American cooperative programs.

THE PLANNING that had gone into 10 years of operation of the bilateral health programs of the Institute of Inter-American Affairs was examined and appraised on the basis of the following general considerations:

1. Program planning is one of the most important functions of management, whether the enterprise be in the field of business, government, or philanthropy.

2. Experience has shown that the benefits or dividends from operations vary directly with the quality of planning. Poorly conceived plans giving a minimum of benefit usually call for the expenditure of just as much effort and funds in their execution as do good ones.

3. A business enterprise is established primarily to make money, and when dividends de-

cline or cease, search is immediately made to determine what is wrong. No such automatic criterion exists to test the efficiency of social organizations such as government and philanthropy; therefore, management of these organizations calls for a very highly developed sense of responsibility and critical self-evaluation.

4. By definition, a program is a prearranged plan. Also by definition, a plan is an arrangement of means or steps for the attainment of some objective. Thus, if the objective is not clearly defined, the arrangement of appropriate means or steps to achieve it will be difficult, and the program will lack precision and completeness.

### Institute Program Objectives

The program of the Institute of Inter-American Affairs had more precise objectives during its earlier years than in more recent ones. At the time of its establishment, the objectives were: (a) to improve health conditions in strategic areas, particularly with relation to the requirements of the Armed Forces of the United States and those of its American allies; (b) to carry out the obligations of the United States Government assumed by it under the resolution

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This is the eighth in a series of excerpts from the Public Health Service's evaluation of a decade of operation of the Institute of Inter-American Affairs cooperative health programs. Background information on the evaluation survey and on the origin and structure of these programs can be found in the September 1953 issue of *Public Health Reports*, beginning on page 829.

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regarding the health and sanitation problems of the Americas which had been adopted by the Third Meeting of Ministers of Foreign Affairs in Rio de Janeiro; (c) to make possible increased production of critical materials in areas where bad health conditions existed; and (d) to demonstrate by deeds as well as words the tangible benefits of democracy and to win active support of the civilian population.

The first three of these objectives were intimately related to the war effort, and the success in achievement could be measured objectively by the health records of the Armed Forces personnel stationed in the Latin American Republics and by the rate of production of critical materials. However, even though the primary aims were to meet an emergency need, there was a constant interest in long-range projects looking toward improvement of conditions in the hemisphere. Nonetheless, the program in the early years must be viewed as a part of the war effort and evaluated on that basis. A highly creditable level of achievement was attained during this period.

After the Second World War these objectives were replaced by others. In the Institute of Inter-American Affairs Act of 1947 (Public Law 369, 80th Cong.), which authorized the continuance of the Institute, it was stated that the purposes of the Institute should be "to further the general welfare of, and to strengthen friendship and understanding among, the peoples of the American Republics through collaboration with other governments and governmental agencies of the American Republics in planning, initiating, assisting, financing, administering and executing technical programs and projects, especially in the fields of public health, sanitation, agriculture and education."

In line with this directive the Institute declared that the broad, basic objective of its postwar program would be 'to raise the level of living of the people in the several American Republics, and it viewed this objective as within the framework of a larger one—peace and prosperity in the Western Hemisphere.

Thus, postwar objectives were general, and evaluation of success in attaining them was therefore more difficult. The task was further complicated by the fact that many forces were at work, striving to achieve the very same ob-

jectives. Since the survey was concerned with only one part of the Institute program—health and sanitation—the following criteria were established for measuring success: (a) the extent to which the indigenous health organizations were being developed and stabilized; (b) the rate at which programs and methods were being incorporated into the permanent public health structure; and (c) the extent to which health habits and practices of the people were being influenced.

### Responsibility for Planning

The program in each country had to be directed toward the achievement of the broad objectives set forth in the basic agreements between the United States Government and the government of the host country. The responsibility for preparing a detailed plan of operation was shared by the minister of the unit of the host government in which the *Servicio* was established and the chief of the United States field party, who was usually also the director of the *Servicio*.

Program planning ranged from excellent to mediocre. There appeared to be a direct correlation between excellence of planning and the number of years a *Servicio* director had been in a given assignment. In several countries it was observed that the program had changed with each new chief of field party; therefore, the value that might be expected from prolonged intensive efforts was dissipated. Often planning was lost sight of in the pressure of discharging operational responsibilities.

In one country the program during the initial period resulted from dictation rather than joint planning. Instead of the appropriate type of program being determined on the basis of a study of the country's needs, it was determined ex cathedra by the minister and other high government officials. Ten new hospitals were built and 17 existing ones received substantial additions to their facilities. At the time of the field survey in late 1951, 3 of these new hospitals were still not in use. This was an example of poor planning, or more accurately, of no planning.

### Foundation of Good Planning

A knowledge of certain basic facts concerning a country and its people is considered nec-



essary for sound program planning. Characteristics of the population, vital statistics, health institutions, health personnel, governmental structure, voluntary health agencies, social institutions and customs, economic status, and geography and climate are among the areas in which data should be obtained.

An increasingly active interest in program planning was found during the field survey in Latin America. Where the basic facts were incomplete and inadequate, steps were being taken to supplement them. It is recognized, of course, that the collection of basic data is a long and laborious task and that certain of the data will have to be kept current. Rarely will the director of the *Servicio* be able to accomplish the task by himself. The talents of all field party members and of many members of the national health service will have to be enlisted. A continuing responsibility for collecting and assembling basic data might well reside in a special committee appointed by the director of the *Servicio*.

#### *Population Characteristics*

The geographic distribution of the people is likely to have a direct bearing on the type of disease burden and the ease with which the people can be reached in a program for health betterment. If the population is predominantly rural, the problem of establishing contact between the people and the health service will tax the administrator's ingenuity, and this problem will be even greater if the rural population lives on scattered farms rather than in villages.

The age level of the population will indicate whether the program should be directed primarily toward the health hazards of infancy, youth, and early adult life or toward the diseases that characterize old age.

The principal occupations should be known since certain occupations have intrinsic health hazards. The lumberjack in the endemic areas of jungle yellow fever, for example, is in special danger of contracting the disease. Among certain types of miners, silicosis may be a hazard. The factory worker from rural areas appears to be especially susceptible to tuberculosis.

Racial composition of the population should

be determined since susceptibility and resistance to certain diseases are known to be in some way related to race.

Knowledge concerning literacy will have value in determining the most effective means of communication. The techniques used in health education, for example, will have to be adjusted accordingly.

#### *Vital Statistics*

An accurate census is essential in every field of social endeavor. It not only provides the information required to establish the characteristics of the population, but it permits calculation of rates and establishment of baselines which are necessary in measuring the effectiveness of health programs.

The number of births, deaths, marriages, and divorces by age and sex where appropriate and by political subdivision should be known. An effort must be made to determine the nature of the mechanism established for the collection of vital statistics and the precision with which it functions; otherwise, it will be impossible to judge the reliability of the statistics or to determine how they may be improved.

The causes of death and, if obtainable, the causes of illness, will help identify the principal diseases of a population. Frequently, the incidence of a disease in an area, or in an entire country, is unknown, and just as frequently no mechanism for ascertaining the facts exists. In such circumstances, a sampling survey may have to be undertaken. The prevalence of hookworm infestation, for example, was not appreciated in many Latin American countries 30 years ago. Surveys revealed that hookworm infestation affected up to 100 percent of the population and that actual disease occurred in from 10 percent to 50 percent or more.

Information as to the average family income should serve as an ever-present warning to avoid activities that call for expenditures by householders beyond their financial competence.

#### *Health Institutions*

The majority of health institutions are concerned with the prevention, diagnosis, and treatment of disease. They include the health departments with their health centers, specialized clinics, and other preventive services; the

laboratories for the control of water, milk, and other food products, and the diagnosis of morbid conditions; and hospitals of all types.

Another smaller group of institutions whose importance cannot be overestimated is the research group. These institutions determine in large measure the rapidity with which advances may be achieved in medical care, both preventive and curative. Often, of course, the institutions primarily concerned with the application of medical knowledge, such as hospitals, diagnostic laboratories, and health departments, also engage in research. Their investigations are as likely to be focused on administrative practices and organization as on medical knowledge per se.

A complete list of these several institutions is necessary to determine whether or not they are readily accessible to the population and to what extent they are capable of meeting the needs of the country.

#### *Health Personnel*

The number and distribution of medical and health personnel serving a population and the nature and capacity of institutions for training such personnel should be determined as accurately as possible. The number of physicians, engineers, dentists, dental hygienists, hospital administrators, nurses, nurse's aides, social workers, sanitarians, dietitians, and other specialized workers will indicate where expansion of training institutions is most needed. The extent to which such personnel is concentrated in urban areas, especially when the rural population carries the principal disease burden, must also be known. Some estimate as to the quality as well as the quantity of workers in the health and medical fields is highly desirable, though obviously more difficult to determine.

#### *Governmental Structure*

The organization and the functions of each part of the host government having a responsibility in the health field should be recorded.

Though the ministry of health in Latin American countries usually carries the major obligation for health services, the ministry of social welfare and the ministry of social security,

where these exist, frequently administer a part, if not all, of the hospitals and custodial institutions of a country. The ministry of education frequently has the obligation to maintain school health services and to this extent also shares in the administration of the nation's health services. This ministry's major responsibility in the health field, however, usually concerns the preparation of medical and health personnel. The ministry of public works is likewise tied in closely with the health field in view of its role in the construction, and often design, of hospitals, health centers, water supplies, and sewage treatment plants.

#### *Voluntary Agencies*

A careful analysis of the programs conducted by voluntary health agencies should be made so that due weight may be given them in planning the national health programs. The Red Cross, for example, frequently operates schools of nursing and health centers. In a number of countries a large part of the campaigns against tuberculosis and the venereal diseases is carried on by voluntary organizations.

#### *Social Institutions and Customs*

Social institutions, customs, and cultural traits are less easily identified and understood than the infectious diseases, for example, but they are equally important, if not more so, in planning health programs. The health planner needs to be familiar with the current beliefs of folk medicine and the attitudes of people toward modern scientific medicine. He must have an understanding of the habits of the people, the motivations of individuals, and their goals in life. Land tenure laws, social legislation, and housing are also important subjects in this field.

#### *Economics*

The economic potentialities of a country, as well as its present status, must be understood as a basis for realistic planning and as a means of protection against undertakings which are beyond the national resources. The level of productivity, the nature of the labor market, the trend towards industrialization, the national income, and the tax system are additional matters requiring investigation.

### *Education, Agriculture, and Industry*

The fields of health, education, agriculture, and industry are interrelated and interdependent. If the level of living of a people is to be raised, no one of them may be ignored. The planner in the health field must therefore understand the problems of education, agriculture, and industry and, whenever possible, should seek ways and means whereby the health program will aid and reinforce programs in these fields and should attempt to utilize related programs to aid the health programs.

### *Geography and Climate*

The geographic and climatic characteristics of a country have a direct relationship to many of its health problems. Not only physical factors, such as altitude, latitude, soil, insolation, temperature range, humidity, and rainfall, but many biological factors as well, are involved. The fauna and flora also determine in no small measure the health hazards of an area.

### **Formulation of a Program**

The next step in program planning is to determine from a study of such basic data what the outstanding problems of the country are and which ones are susceptible of solution. It is at this stage of planning that the experience and judgment of the minister and the chief of field party are of crucial importance. They and their advisers must assign priority values to the several problems calling for solution. Program formulation may then proceed.

Depending upon circumstances, the program objective may be attained by a single project, such as the installation of a water supply system, or by a series of projects, such as those aimed at the control of tuberculosis. In the latter case, one project of the series might be an epidemiological study of tuberculosis to determine its incidence rate, the principal avenues of dissemination, or the role that BCG vaccination might be expected to play. Another project might be a case-finding campaign. Still another could be the establishment of a tuberculosis hospital.

Though projects will differ widely in their aims and provisions, they should resemble one

another in their formulation. The project agreement drawn up by the chief of field party and the minister should provide the following information: (a) the nature of the problem and objective of the project; (b) any previous projects which are similar; (c) a complete description of the project, including the location, the reasons for selection of the project, and the manner in which it is to be developed; (d) a clearly defined plan of administration; (e) the proposed time schedule; (f) arrangements for the transfer of the project to the national health service; (g) an estimate of the amount of money to be spent; and (h) the sources of funds.

The project agreement should be so complete and well documented that a new chief of field party or a new minister would have no difficulty in understanding the project or in discharging his responsibilities for its successful completion. The goal which the project aims to achieve should be precise and limited so that the accomplishment may be measured objectively.

### **Evaluation of Program Planning**

In general, project agreements were found to be well prepared. The principal shortcomings were (a) the frequent omission of terminal dates, despite the fact that provision usually existed for an extension of the date if it were required; and (b) the absence of arrangements for the orderly transfer of responsibility for the project from the *Servicio* to the appropriate government agency.

### *Planning for Transfer*

Chiefs of field party were sometimes reluctant to relinquish responsibility for completed projects for reasons that seemed unconvincing. For example, fear was expressed that a project when transferred to the host government would not be maintained at the same level of efficiency as under *Servicio* administration. If this fear were supported by facts showing, for example, a lack of funds or personnel to carry on the project, it could only mean faulty planning. Such prejudgments were regarded as neither persuasive nor trustworthy. The better procedure would have been to try out the new administrative auspices. If failure ensued,



then the reasons for failure could be identified and appropriate corrections applied.

In one instance, the director of the *Servicio* declared a certain health center, which had been in operation long enough to be considered an accepted method for providing preventive medical services, to be indispensable to him as a training center for *Servicio* personnel. In this particular country, the ministry of health had a section in its organization charged with responsibility for the training of personnel, which could have been used to meet the *Servicio's* needs.

An example of inadequate planning for the final transfer of a project to the constituted health authorities of the cooperating countries was found in one country. Although at the time of the survey, *Servicio* operations were in the hands of Latin Americans, difficulties had been encountered in transferring completed projects to the national health department. What had not been done, or could not be done, was to transfer with completed projects the privileges and immunities enjoyed by the *Servicio* but denied to the national health department. By virtue of the basic agreement between the ministry of health and the Institute, the *Servicio* had relative freedom to hire and fire personnel and was exempt from many bureaucratic controls on administration and utilization of funds. The national health department, recognizing its inability to equal the effectiveness of the *Servicio*, had therefore been reluctant to assume responsibility for certain of the major health and sanitation projects. A *Servicio* responsibility for many years, these services should be relinquished; yet, it appears that for the present the *Servicio* will be required to continue their operation.

### Conclusions

The indigenous health organizations in Latin America usually, but not invariably, have been developed and stabilized as a result of the *Servicio* projects. More attention to planning might well have mitigated some shortcomings, however.

The rate at which programs and methods were incorporated into the permanent public health structure has been generally satisfac-

tory, although incomplete planning sometimes has retarded the process.

Although the extent to which health habits and practices of the people have been influenced is difficult to evaluate precisely, many of the situations studied indicate that the people's habits and practices were, in fact, favorably influenced.

### National Advisory Health Councils

A survey of health program planning cannot be limited to planning done by the *Servicios* since health programs in Latin America are for the most part formulated and executed by the constituted health authorities of the national, state, and local governments. In some countries private agencies play a major role in health activities. In almost all the countries, the Red Cross conducts a health program that supplements that of the government.

In certain countries the entire campaign against tuberculosis is the responsibility of a private or voluntary agency. Notable in this regard is the *Liga Ecuatoriana Anti-Tuberculosis* which maintains in various parts of the country 23 dispensaries and 8 hospitals with a total of 2,000 beds. Not infrequently the hospitals, or a large portion of them, are operated by a voluntary organization termed *Beneficencia*. These voluntary agencies are usually subsidized by government, and in addition they benefit from lotteries or special taxes authorized by government.

Because the ultimate responsibility for all health programs rests essentially with the government, considerable advantage could result from joint planning. Moreover, since the success of health programs, whether official or voluntary, depends to a considerable extent upon an alert and informed public, it would appear desirable for the public to be brought into a relationship with the official planners.

A mechanism to secure both the benefits of coordination and of broad public support of health programs would be a national health council, advisory in character. Such a council could be created by the ministry of health. Membership should include representatives from all the national agencies concerned with health, the voluntary organizations, the uni-

versities, and the technical schools, as well as persons from philanthropy, business, finance, and industry. The council's membership would thus represent a cross section of society of the nation and would embrace the planners, providers, and consumers of health programs.

The advisory character of the council should be maintained. It should have no executive, financial, or administrative responsibilities. However, because of its composition, its advice should carry great prestige. Health plans of government might thereby be greatly strengthened.

In countries where governments may on occasion change suddenly, a national advisory health council would have the added value of providing a link between the old and the new, giving greater continuity to health activities, especially planning.

### National and International Conferences

A number of agencies in addition to the Institute of Inter-American Affairs are engaged in cooperative health programs with many of the governments of the American Republics. Important ones are the Pan American Sanitary Bureau, which serves as the regional office of the World Health Organization; the United Nations Children's Fund; the Kellogg Foundation; and the Rockefeller Foundation.

The interests of these several agencies are not so very different, one from the other, and their cooperative programs in the American Republics are in consequence closely related. In Chile, three of these agencies—the Kellogg Foundation, the Rockefeller Foundation, and the Institute of Inter-American Affairs—cooperated with the government in the development of nursing education and medical education. The latter two agencies worked with the government in establishing the National School of Public Health in Santiago.

The National School of Nursing of the Central University in Quito, Ecuador, is another example of joint action. The PASB, the IIAA and the Rockefeller Foundation joined forces in aiding the Ministry of Health in the development of this institution. Aid included the provision of two American nurses to help with

organization and guidance in the early years, the reconstruction of a building to house the school, the purchase of equipment, some assistance in the initial cost of operation, and provision for a consultation service.

In almost every Latin American country examples could be cited of participation by more than one of these agencies in the national health program. The fact that so little real overlap and duplication of program activities was observed is a tribute to those responsible locally. However, it must be recognized that there is a degree of competition among the agencies to secure cooperative projects and funds to finance them, with the consequent danger of adverse effect upon the national health budget.

It would be a part of good planning for these cooperating health agencies and the several national health services to adopt some device for protection against possible adverse effects from uncoordinated program developments. More important would be the positive benefits that could accrue from the application of the joint resources in technical skills and funds toward a common objective. To this end, it is suggested that clearinghouse conferences be established at both the international and national levels. At these conferences an opportunity would be provided each agency to describe its program interests and its plans for project development. Opportunities, if any, for joint action would become apparent.

A beginning at the international level has already been made in Washington, under the chairmanship of the director of WHO-PASB. Monthly meetings are being held with representatives from PASB, the IIAA, the Division of International Health of the Public Health Service, and other agencies. These have already proved useful.

A similar arrangement seems desirable for each American Republic where more than one foreign agency is cooperating. Since all international health agencies enter into bilateral agreements with the various governments in developing programs, the leadership in establishing clearinghouse conferences at the national level should be taken by the health authorities of each country.

# technical publications

## Fifty-first Annual Conference of the Surgeon General, Public Health Service, Chief, Children's Bureau, With State and Territorial Health Officers

*Public Health Service Publication No. 307. 1953. 75 pages. Available on request to the Division of State Grants, Public Health Service, Washington 25, D. C.*

The fifty-first annual conference of the Surgeon General, Public Health Service, and chief, Children's Bureau with the State and Territorial health officers, State mental health authorities, and representatives of State hospital survey and construction agencies was held December 8-11, 1952, in Washington. This publication constitutes the proceedings of the conference and includes the complete text of addresses given in the general sessions and the recommendations of the committees on environmental sanitation, Federal relations, hospitals, infectious diseases, maternal and child health, mental health, and special health and medical services. [Highlights of major addresses were published in *Public Health Reports*, February 1953, pp. 174-190.]

## Health Manpower Source Book

### Section 2. Nursing Personnel

*Public Health Service Publication No. 263. 1953. Prepared by Helen G. Tibbetts and Eugene Levine. 88 pages; tables. 40 cents.*

The second in a series of comprehensive source books on health manpower, this publication covers 50 years of nursing and contains 56 tables of data on nursing personnel, each preceded by a discussion of the background and methods used to gather the data.

The first part of the book deals with the general distribution of professional nurses; their age, sex, and marital status; licensure; and education. The second part presents data on the licensure and training of practical nurses. The last part of the book, fields of practice, gives comparative data for six fields of nursing and details on public health, industrial, and hospital nursing personnel.

A summary of trends is given at the beginning of the book. As of 1950 there were 249 active graduate nurses per 100,000 population in the United States. In 1910 the ratio was 55 per 100,000. In 1920 active graduate nurses were fewer than physicians; since 1930 they have outnumbered physicians. Since 1900 the proportion of men among active graduate and student professional nurses has declined from 6 percent to 2 percent, although their number has increased from 758 in 1900 to 11,329 in 1950.

## Home Accident Prevention A Guide for Health Workers

*Public Health Service Publication No. 261. 1953. 75 pages. 30 cents.*

Accepting the thesis that the majority of home accidents can be prevented, this booklet presents an outline and guide to enable health workers to study and understand the chief causes of accidents in the home and to take measures that may prevent them. The material is prepared for the professional health worker on the premise that leadership in home accident prevention program development should be assumed by this group.

The problem of home accident prevention is defined in relation to other health needs. Factors, environmental and human, tending to cause accidents and their interrelationships are outlined. Suggested activities by agency, group, or individual for better understanding and treatment of

the problem are presented throughout the guide.

A 20-page list of selected references, coded to designate the various classifications of the content material, and a 2-page list of films and filmstrips are included.

## Six Food Exchange Lists for Variety in Meal Planning

*Public Health Service Publication No. 326. 1953. 4-fold leaflet. Available on request to Division of Chronic Disease and Tuberculosis, Public Health Service, Washington 25, D. C.*

Selection of a varied diet, especially for the diabetic person, is made easier by the use of the six food exchange lists developed by committees of the American Diabetes Association and the American Dietetic Association, in cooperation with the Public Health Service. The leaflet sets forth six lists of food items—milk, vegetables, fruits, bread, meat, and fat. All foods within the same list contain approximately equal amounts of carbohydrate, protein, fat, and calories, and thus one food in a list may be substituted for another food on the same list. For example, on list 4 one small potato may be used in place of a slice of bread.

This leaflet does not give a diet prescription. A physician should prescribe the amounts of food and the number of exchanges allowed each day. The food exchange lists facilitate selection of a variety of foods for a diet that is being followed.

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Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication (including its Public Health Service publication number). Single copies of most Public Health Service publications can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

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## Training Courses in Prothrombin Time Determinations

Clinical research during the past decade has shown that the proper use of anticoagulant drugs can reduce morbidity and mortality from thrombosis and embolism. Safe and effective use of these anticoagulants, however, requires a more complete laboratory control than is necessary for most drugs, since their safe administration depends upon reliable laboratory data for control of the dosage.

Refresher courses in this technique are offered by the heart section, Division of Chronic Disease and Tuberculosis, Public Health Service, with the sponsorship and/or cooperation of the various State health departments, American Heart Association, pathology societies, and other interested organizations. The purpose is to present to medical technicians the critique of performing accurate, reproducible prothrombin time determinations, and to afford an opportunity for supervised laboratory experience with these methods.

Services and materials available through the regional offices of the Department of Health, Education, and Welfare include a brief description of the course; services of a physician-director and a technician-instructor in planning and conducting the training course; a teaching manual; and laboratory manuals for participants.

Since the pilot technician-training program began in Massachusetts in 1950, refresher courses have been provided in 12 States and 1 Territory (see table). In at least 9 other States, technician-training is now being provided on a long-range basis by local institutions.

State	Number technicians trained	Number laboratories or hospitals represented	State	Number technicians trained	Number laboratories or hospitals represented
Arkansas.....	22	16	North Carolina.....	47	38
Florida.....	88	64	South Carolina.....	14	11
Idaho.....	6	5	Tennessee.....	10	8
Kansas.....	28	26	Utah.....	23	13
Maryland.....	1	1	Puerto Rico.....	15	11
Massachusetts.....	71	55			
Montana.....	15	9	Total.....	366	279
New Jersey.....	26	22			

NOTE: At the time this table was prepared, a series of courses was being given in Virginia to about 18 technicians.